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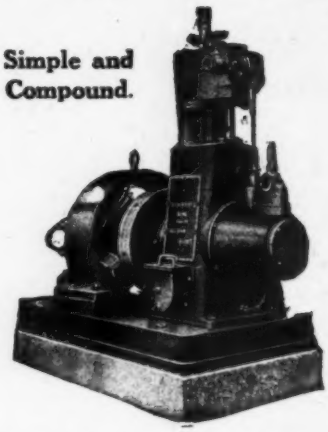

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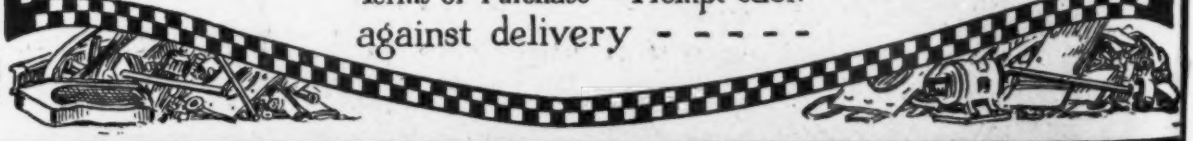

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ELECTRICAL REVIEW.

VOL. LXXXV. NOVEMBER 14, 1919. No. 2,190.

ELECTRICAL REVIEW.

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"ELECTRICAL REVIEW": TIME OF PUBLICATION.

Readers who are receiving their copies of the ELECTRICAL REVIEW a little later than formerly, are reminded that as the result of changes in printing arrangements and in consequence of rapidly increasing circulation, publication recently had to be deferred until Friday afternoon. The REVIEW is now on sale in London at 4 p.m. on Fridays; copies sent by post or obtained through local agents should reach the hands of subscribers on Saturday mornings.

TRAMCARS OR OMNIBUSES?

DURING the last few weeks, *apropos* of the London County Council's proposals for tramway extensions to cost some eight millions sterling, a storm of abuse has been levelled at the tramway by the lay Press, with a unanimity equalled only, to our mind, by the singular lack of information displayed. Unfortunately, the question, at the moment, is inextricably entangled with conditions which are peculiar to the metropolitan area, and which undoubtedly place the electric tramway at a serious disadvantage in that area. Chief amongst these special conditions are the use of the underground conduit, the extensive street widenings which have been, and will be, undertaken, the high rates, and the unrestricted competition of the motor omnibuses and electric railways, while the burdens of maintaining the roadway and carrying workmen at a loss are shared by other tramway undertakings, but not by omnibus companies.

When the question of tramways for London was under consideration we did our utmost in these pages to avert the adoption of the conduit system, pointing out that the cost would be enormously in excess of that of the overhead trolley system, and that the latter met all practical requirements; but the County Council turned a deaf ear to all warnings, and has only learnt the lesson at a very heavy cost—for a good many years now the Highways Committee has installed the trolley wherever possible. The extra and unnecessary capital outlay incurred on the conduit system has always remained a deadweight on the undertaking, which, without that handicap, should have been by far the most prosperous and successful one in this country. Similarly, we protested against the imposition upon the tramways of the cost of numerous street widenings and other improvements, which were urgently needed quite apart from the construction of tramways—but the latter offered a convenient victim upon which to unload the outlay. The high rates, of course, are unavoidable—but the tramway undertaking is rated upon its track as well as its buildings and plant, whilst the omnibuses have the roads as a free gift, except for the small petrol tax. This brings us to what is, perhaps, the most glaring injustice of all—the use of the roads by omnibuses for a commercial carrying service, often the very roads which are maintained by the competing tramway undertaking! So blatant is the unfairness of this system that the Commission which recently inquired into the London transport services expressed the view that the omnibuses should be made to pay their fair share. We would specially emphasise the fact that in London the County Council has no power to exact a contribution from the omnibus companies, though provincial local authorities can veto the use of the streets by omnibuses, or make them pay for the privilege.

It will be seen that the London tramways, as we have mentioned above, suffer under burdens partly due to the County Council's own policy in the past, partly due to defects in the tramway law, and in the administration of

the London transport services, but burdens unquestionably far greater than those of any other city. Hence to compare the results obtained in London with those recorded in Glasgow or elsewhere is futile. The case is unique. It is easy, under these circumstances, to attack the tramways on the score of their alleged inability to compete with the petrol 'buses, and it is about as sportsmanlike as to kick a man when he is down.

However, no doubt the uninformed but eloquent critics, who act also as self-appointed judges, jury, and hostile witnesses, may be forgiven, because they act in ignorance. Let us look at the facts.

We are told that the congestion in the streets is largely due to the tramways. As a matter of fact, it is in most instances due to the unsuitability of the streets for the transport services of a great city—they are narrow and often crooked, and badly laid out. That is not the fault of the tramways. Further, the congestion is largely due to the motor-'buses. The tramcars, it is true, accumulate in a long line when there is a block—but the 'buses can, and do, accumulate two or more abreast. At Hyde Park Corner (where there are no tramways) we have frequently seen blocks of the most complicated order due almost wholly to the motor-'buses, and that is by no means the only place that we could cite. Further, the old trouble of the standing vehicle, blocking the traffic by neutralising a strip of road equal to its own width while it is being loaded or discharged, is a most fruitful factor of congestion, even in narrow City streets where roadway is literally precious. This is an abuse which demands a drastic remedy. But there are other important factors too, such as the concentration of immense volumes of traffic upon far too few main thoroughfares, the mixture of fast and slow vehicles on the same roads, and the dearth of bridges over the Thames, for which neither the tramways nor the omnibuses are to blame —they form parts of that most inefficient and most misgoverned system of chaos which goes to make up the London transport "facilities." The root question is not "tramcars or omnibuses"—it is vastly broader and more fundamental than that. We trust that the new transport authority will soon tackle this most important and complex problem, on enlightened lines, and without prejudice.

Let us turn now to the simple issue between the car and the 'bus, quite apart from any consideration of London's troubles. What data on the subject are available? In September last Mr. Fearnley, manager of the Sheffield tramways and motor-omnibuses, supplied from several years' experience all the figures that are needed.

He showed that at least twice as many 'buses as cars would be required to give the same service in fine weather, and three times as many in foul weather; that the cost of running motor-'buses, per passenger, was three times as much as that of tramcars; the capital charges were 12 per cent. greater, and the total costs per passenger were 2·76 times as much as for the tramcar, while the average fare charged was 2·3 times as much on the omnibuses as on the cars. The high capital charges are significant; although a fleet of motor-'buses costs far less than a tramway undertaking, the life of the plant is far shorter, so that, as Mr. Fearnley points out, the annual capital charges for the 'bus are actually the greater —and *that without allowing for the upkeep of the roads*. Now, in reckoning the cost, it is imperatively necessary to take the cost of maintenance of the roadway into account, and the construction of the improved roads that are required would be very expensive, so that the total annual costs chargeable to the omnibus services would be at least double those of the tramway, thus further increasing the cost to the undertaking and to the passenger. The substitution of 'buses for cars would increase the demand for liquid fuel, which is already at an exorbitant price, and does not tend downwards.

The proposition to replace the tramways by motor-'buses, therefore, will not bear examination from the commercial point of view. As for providing cheap transport for workmen, who, by the way, do not now require thus subsidising, it is out of the question.

We note that our contemporary *The Engineer*, while criticising the L.C.C. tramway scheme, does not suggest that the motor-omnibus affords a solution to the traffic problem; it proposes the construction of additional tube railways.

What is really wanted for London is a new authority, armed with full powers to deal with *all* the transport services of the whole of the metropolitan area.

An Electricity Board for London.

One of the first attempts to form a scheme under the new Bill is that which has been put forward by the London municipal undertakings to cover the area of Greater London. Up to the present, details are not forthcoming, but a *résumé* of the main lines of the scheme has been published. The scheme follows broadly the lines of the report issued by a conference of the same authorities in December, 1918, which was dealt with in our pages at the time. As a constructive scheme it is a mere skeleton. The assumption on which it proceeds is that the electrical needs of Greater London can for the present be met by the existing generating stations by developing them to their full capacity, and interconnecting them. The central District Authority to be set up does not apparently intend to purchase generating stations to any extent, if at all. The District Authority will have under it four "Divisional Boards," whose duty will be "the practical supervision of electricity in their areas." Whether this means that their functions are merely regulative, or whether they will be an effective trading body with plant of their own, is not clear. As regards the provision of new super-stations, the scheme apparently does not anticipate doing anything in this direction immediately; it seems to betray some diffidence in committing itself to big turbo-alternators, in view of the possibility of something new coming along in the future and supplanting them. The report is very vague as to how the company undertakings are to work in with the scheme. Under the new Bill the companies can retain the distributing parts of their undertakings until 1931, and must then either be left to continue or else bought out. It is the heavy amount required for expropriation, independently of the exact time when purchase takes place, which has always been one of the insoluble factors in the problem, and the present proposition leaves the matter still open. The relation of the central control authority proposed in the scheme to the administration provided under the Bill is obscure, and it is difficult to see how by merely interconnecting the existing generating stations, the supply to London is to be radically cheapened and made "abundant" in the broad sense of the Bill.

The present skeleton report will, one would imagine, have to be radically amended before the Electricity Commissioners will consent even to consider it. The Electricity Commissioners will undoubtedly require that whatever schemes are brought forward, they must stick to the one object of bettering supply, and whether municipal or company in origin, must be free from all taint of party prejudices, which, after all, have no bearing on the immediate issue.

Prices and Wages.

The effect of wage advances on the prices of finished goods has been more assiduously considered during the period that has elapsed since the commencement of the war than at any other time of which the history exists, and the question has been investigated and discussed by a greater number of people. It has not always been those who have devoted the most careful thought to the subject who have been the most vocal in advocating some solution of the difficulties, or panacea for the woes, of a distressed world. It is even yet impossible to fix up contracts for the supply of engineering products without some flexible price clause,

providing that the contract price shall be adjusted by some percentage for every shilling per week by which the rates of various kinds of labour may be altered by the mutual agreement of the parties concerned, and that extras for raw material shall be passed on.

It may, we suppose, be granted that, if the same class of article is produced by the same methods in approximately constant quantities, the cost of the finished article will be dependent, absolutely, on certain definite factors, of which the cost of labour is one. The old-fashioned commercial man then says to himself, or, more probably, proclaims noisily from the housetops: "If I double my output, the price will be the same, because labour costs the same. Until wages fall I cannot produce more cheaply." But this is all nonsense—if we had dipped our pen in Lord Fisher's ink, we should have strengthened the expression.

It must come to be realised by even the most obdurate, wooden-headed, and lethargic of manufacturers that the way to increase output is not by the application of more manual labour, but by the application of more brains, their own included. Difficult as this may seem, it is the only method by which we can go ahead.

It is by the increase of standardisation, the elimination of little fancy freaks in construction, the application of brains to design, and of labour-saving machinery and devices to manufacture, that cheapness will be obtained; and until goods can be produced cheaply it is useless to produce many of them. Manufacturers must do their share, and many of them have already done much; but customers also have their duty to perform. We indicated in May last one way in which the customer could help, viz., by using as far as possible the standard specifications of the British Engineering Standards Association, and we have lately learned with pleasure that some considerable degree of progress has since been made in this direction with regard to electrical machinery.

If the users and designers of machinery can agree to facilitate manufacture in this way, the clear advantage follows that the same amount of labour will be able to turn out more machinery. What is true of machinery is true, *mutatis mutandis*, of other things. The important truth is thus brought out that the cost of labour is not a constant, invariable factor in the cost of the finished article, and it is a fallacy to suppose that the reduction of wages is an essential preliminary to the increase of production, the reduction of prices, and the diminution of the cost of living. Prices can and must go down; wages may do otherwise. By this means the standard of living of all classes of the community will be advanced, and it is the duty of all classes and individuals in the community to do their utmost to achieve this end.

Orders on Hand in Germany.

It is difficult to understand German reports concerning the situation of trade in that country, but we cannot refrain from referring to statements made by the chairman of the Rheydt Cable Works Co. at the annual meeting on November 4th. The chairman stated that the works had raw materials on hand which would last the company for months forward, the only anxiety being that relating to the supply of coal. During the four weeks previous to the day of the meeting, one-half of the works had to remain idle owing to the lack of coal, and not a single kilowatt-hour of energy was obtainable. The available funds had been drawn upon so largely since the end of June that the company would have to procure credit at the bank in a few months if present conditions were to continue. If all the orders could be turned out they would occupy the company for nearly eight months; but a large stock of orders on hand meant nothing. "All works," the chairman added, were full of orders "right up to the roof," but were unable to effect delivery owing to the conditions connected with the coal famine; and the hope was expressed that the workmen would soon understand that it was impossible to manage with the eight-hour day. The coal problem appears to be not so much a question of production—because the output has been increased recently with the employment of more men at the pits—as a matter of transport on the railways, and in order to afford some measure of relief, all the passenger-train services throughout the country have been suspended for a period of 10 days, which will expire to-morrow.

The I.E.E. Meetings.

The new session of the Institution is now fairly under way, and an attractive programme of subjects for papers and discussions has been issued, showing that the proceedings at the various Centres will be full of interest and instruction. Unfortunately, the Institution headquarters is not yet available to the members, but we believe they will not have to wait much longer for their reinstatement, an event which will be welcomed with profound satisfaction. It will be noted that the "informal meetings" inaugurated by Mr. Wordingham will commence in future at 7 o'clock, a change to an earlier hour which we advocated from the first, and we trust that this will add to their popularity. The programme for these meetings, however, has undergone a change which we should hardly consider desirable. Whereas last year the subjects for discussion were, in the main, of a technical or industrial character, the first three meetings this session are to be devoted respectively to engineering advertising, labour, and the functions of a trade journal. We have consistently urged that the Institution should not confine its attention strictly to technical and scientific subjects, but we must confess that such a programme as this strikes us as, to say the least, eccentric. We understand that the management of these meetings is in the hands of a committee of the junior members, and, of course, if they like to discuss this sort of thing, there is no reason why they should not do so; but do they? We fear that the choice of subjects must be regarded rather as an indication of a poverty of ideas, a *dernier ressort*, and that impression is strengthened by the fact that each of these discussions is to be opened by a member of the Committee. Such an arrangement was excusable at the inauguration of the scheme, but is it to become an established practice? In the best interests of the scheme, it is to be hoped that more life will be infused into it, and that attractive subjects will be chosen for the remaining meetings of the session.

Gas and Hygiene.

It is interesting to observe the changes that take place in the policy and articles of faith of the advocates of the use of gas in place of electricity, as the occasion arises. Not many years ago we were told that gas lighting was hygienically preferable to electric lighting, because it inherently necessitated good ventilation of living rooms; that the hot gases arising from gas lamps went through the ceiling (presumably into the room above), and in so doing deposited on the plaster the microbes killed by passage through the flame, thus blackening the ceiling, to the great benefit of the residents. What advantage the latter derived from the destruction of bookbindings and the disfigurement of decorations generally, we do not know, but we fully agree that gas lighting teaches one to appreciate the value of good ventilation, while gas-heating simply compels one to adopt it. The argument with respect to electric lighting was that as the latter gave off no noxious fumes, one did not trouble to provide for ventilation, and, consequently, suffered in health.

However, the gas experts have changed all that. Dr. Rideal has carried out an inquiry into the "alleged" hygienic superiority of electric over gas light, with the result that we are now assured that in a room carefully deprived of ventilation, there was no noticeable difference as regards the composition and temperature of the air, whether gas or electric light was used. Experiments carried out on men confined in crowded and ill-ventilated rooms lit either with gas or electricity showed negative results as regards the illuminants, the effects of heat, carbonic acid, and moisture present in the atmosphere being due to the persons themselves, and not to the illuminants. Result—a draw. But we used to be told that gas was superior—now it is struggling to maintain that it is *not inferior*.

After all, is any test necessary? Those who have tried both have no doubt on the subject whatever.

SPECIALISATION: HOW THE WORKER IS AFFECTED.

By WILLIAM J. HISCOX.

The workers of the country are somewhat apprehensive with regard to the virtual control of the electrical industry by the huge combines which have recently been formed, and not a few are of the opinion that the worker stands to lose; that should he have the misfortune to fall foul of one of the firms inside the ring, his chances of obtaining employment with another of the amalgamated firms will be very remote. The writer of the present article is not of this opinion, but that the result will not be altogether to the worker's advantage is a point which may be discussed in this article.

It will be observed that each electrical ring is composed of a certain number of firms, each of which, in the past, was interested in a number of different lines of manufacture. These firms competed against each other, both in home and in foreign markets, and the first result of amalgamation will be that this competition will cease. Instead of the competition of individual firms, therefore, the competition will be between the various groups of firms, *i.e.*, the combines.

This in itself will not affect the worker, except that, as a consequence, smaller firms outside the combines may find it difficult to compete, on account of the advantages that the firms inside the combines should enjoy. For the object of the combine is to produce economically, by consolidating the organisations of its various units, and by sectionising the various products to the best advantage. This means that a certain class of manufacture will be handled by the firm possessing the equipment most suitable for its production, and thus prevent overlapping.

In this respect, therefore, instead of a firm interesting itself in 20 or 30 different lines of manufacture, it will now only be concerned with, perhaps, three or four; and whereas, in the past, it had to compete with 100 other firms for orders in connection with any one of the lines in which it was interested, to-day it competes with the specific firms in the other combines entrusted with the production of similar lines of manufacture. In addition, it must, of course, compete with firms outside the various combines, but the inference is that the resources it has at its disposal are such as will enable it to regard firms engaged in a similar line of manufacture, linked up in the other combines, as its only serious rivals.

Assuming this to be the case, then it becomes a matter of competitive organisation between the various combines, and it is in this respect that the worker has need to be concerned. The term "worker" is here used in its broad sense, as it is intended to denote every person working, either for a salary or a wage, from the works manager downwards. It is too often assumed that a "worker" is a man who works with his hands, the brain worker being excluded from this category, but the plain fact is that, although *all* workers are affected (or will be) by the stupendous changes taking place, it is the brain worker who has the greater need to feel apprehensive.

We are fast approaching the time when the only thing that counts in industry will be efficiency, and the standard of efficiency demanded will be considerably higher than in the past. It is a melancholy fact that, at the present time, the proportion of really efficient men is deplorably low, and this especially applies to the higher positions in the industrial world. That this is true may be gauged by the fact that at the present time we are bemoaning our lot, and crying out that the "worker," *i.e.*, the manual worker, is letting us down, and is not producing in 47 hours what he used to produce in 54. And if that is indeed the case, who is really at fault? Did we seriously expect that, without a single change in our works system, without the introduction of more economical methods of production—without, in fact, an efficient organisation—the worker could possibly make up that seven-hour loss each week? If we *did* think that, then indeed we are in need of an efficiency course, or else suitable candidates for a mental institution.

That a proportionate gain is made manifest consequent upon the diminution of fatigue is readily admitted, but for the rest, the onus is upon the employer to adopt such measures as will result in economical production, and consequently increased output. This is only logical, and it appears that the electrical industry has grasped this essential, and that the formation of the "combine" is in accordance with this policy.

But the object of this article is to discuss the effect this organising will have upon the worker—whether it will be to his advantage, or the reverse. In the first place, it is taken for granted that if no business is forthcoming, then there is no necessity to utilise labour; that the greater the increase of business, the greater the demand for labour. If, then, the primary business of the combine is to get more orders, even if to do so more economical production is essential, it appears, on the surface, that the worker benefits, inasmuch as, the greater amount of business secured, the greater will be the demand for his labour.

That seems quite satisfactory so far as the industrial population, as a whole, is concerned; but the question which arises is, "How will the individual worker fare?" We have not yet advanced so far along the road of Socialism as to call all men equal, or even to speak of them collectively, so for the moment the worker is an individual considering, in the first instance, himself. But, although an individual, he can, for the purposes of illustration, be classified with a certain group, and in this connection, therefore, it is here proposed to divide the workers into two groups—the "ambitious" and the "plodders."

To take the plodders first, their case is not so bad as that of their ambitious brothers, and yet it is possible, under the new conditions, for their future state to be worse than the present. To classify a worker as a plodder does not mean to label him a "dud," for many of the plodders, given the opportunity, could greatly outshine many of the so-called geniuses. Many a man remains a plodder through no fault of his own, on account of domestic troubles and other things not directly connected with industry. Others remain plodders because they have not been given any opportunity, not realising that opportunities are rarely given, and have to be sought for, and the fact remains that the great majority of the workers are "plodders."

The "plodders" do not draw their associates from any specific branch of industry, for they will be found among the labourers of the factory, the mechanics, the clerks, heads of departments, and even works managers. It does not follow that because a man has reached the latter position he is not a plodder, for unless he is still striving and scheming and educating himself to cope efficiently with his ever-increasing responsibilities, it cannot be said that he is eligible to class himself among the ambitious.

It is the plodder who, in one way or another, has managed to get above the lowest rung of the ladder, who will be in grave danger at the dawn of the era of scientific organisation, for his hold is so precarious that very little effort will be required to dislodge him. There will be no room for the inefficient works manager or departmental head, for the position that he occupies will be wanted for one who is efficient, who has been educated in modern methods, and is competent to discharge the obligations that the position must necessarily entail. Thus shall we see, in one respect, at least, that the plodder does not stand to benefit by the introduction of economical organisation.

With the great mass of manual workers, the position is somewhat different, though even here the "dud" will not find a place. Repeating, for the moment, that a plodder does not necessarily mean a dud, the point to be considered is the ultimate effect that the organising will have upon the efficient manual worker. In this connection reference must be made to the aims of the combine, which result in the concentration on a specific manufacture in a certain factory.

Sectionising may be said to be the order of the day, and it is safe to assume that the aim of the management will be in the direction of mass production. For this to be

successful, it will be necessary for every operation to be performed by a specialist, and this means that the training of the operator will be within such narrow limits as to preclude the possibility of his adaptability to anything outside the specific task with which he is entrusted. At the present time we hear machine shop operators call themselves "engineers," although it is a well-known fact that they cannot with justice lay claim to that title. They are mechanics, and may with perfect truth be termed turners and millers, but in a short time it is doubtful whether they will really have any claim to these titles, for such will be the concentration that the operator will specialise upon a specific operation in connection with a certain component part, and thus in a short time be incapable of efficiently performing a similar operation in connection with a different component.

It may be that this is anticipating, and it may be regarded as an exaggeration, but the fact remains that sectionising is rapidly developing. Such a state of affairs must necessarily increase production, and at the same time lower costs, whilst the operator would undoubtedly benefit by reason of high wages. Whether the latter factor will compensate him for his impaired general usefulness is a moot point. Whilst he is in employment he will certainly benefit, but when he is discharged, what then? He is a specialist in one direction, but what are his chances of finding another job for which his peculiar talents are suitable? As a turner, he can get a job in any factory as such, but as a specialised A.C. motor-shaft turner his chances are more remote. Still, in this connection we are dealing with the plodder, and, as such, with plenty of work and high wages, the necessity for him to seek work elsewhere should not arise.

With the ambitious worker the same effect, to a certain extent, will follow, for it will be the specialist who will be in demand. It is difficult to see, from this standpoint, precisely what qualifications the works manager of the future must possess, whilst in regard to departmental heads, must we assume that under specialisation these, as such, will not be required? And if the machine shop should cease to exist, and in its place appear the turning, milling, gear-cutting and drilling departments, the personnel of each consisting of specialised experts, what qualification will be necessary in the supervision of any one of these departments?

The whole presents a very pretty problem, and again talk of undue anticipation must not blind us to the fact that there is a very strong tendency in this direction, and that, as a consequence, the ambitious worker will find his general usefulness impaired. He will be a superman within narrowly defined limits, but, outside his specialisation, he will be worse than useless. A works manager's qualifications at the present time include mechanical proficiency as well as organising and administrative ability, but how, under the new scheme of things, will he get the necessary training to qualify for such a position?

It must be admitted that in order to increase production it is necessary to concentrate, and, consequently, specialise: but while this is true, it is certain that, individually, the worker must suffer. It cannot be argued that any of Ford's specialised workers could come over to this country and compete in the factories with our own workers. They serve their purpose where they are at present employed, and draw wages which excite the envy of their British brothers. But where, under such a scheme, is that great factor which plays such a potent part in industry—initiative? Surely it must be stifled.

It will, perhaps, be said that the initiative is in the hands of the leaders—the directors—and that, seeing that increased production is the factor upon which success and prosperity (for the worker and also the community at large) depend, initiative is the rightful prerogative of directors. Assuming for the moment that this is correct, may it not be argued that the men who are directing operations to-day are not specialists, only in the sense that their general and wide experience in most matters affecting industry has fitted them for the positions they now occupy?

These men will not live for ever, and when they are gone, who will replace them? The specialists whom they themselves have trained within such narrow limits? If so, what can be the result? Is it not conceivable that the future state of industry will be worse than the present, and that we may have to fall back upon the methods in vogue 20 years previously? We *must* specialise, but we still must use common sense, and adopt scientific management on broad lines. Unless we do, it is certain that the worker will suffer, and ultimately the whole industry will suffer also.

THE INTERNATIONAL MOTOR-CAR EXHIBITION.

The 13th International Motor-car Exhibition was opened at Olympia, W., on November 7th, and will remain open from 10 a.m. to 10 p.m. daily until to-morrow. The show is strictly for pleasure cars, cycles and commercial vehicles being barred, and one may search in vain for the once familiar red Mercedes and big Benz cars. They are not to be found. German and Austrian cars have been banned from all Allied shows by international consent. At the International Exhibition recently held at the Grand Palais, Paris, British makers did not do themselves justice, and for that matter neither did the American firms. There were few exhibitors of either country; the combined exhibits of Great Britain and the U.S.A. were not equal in number to the French exhibits announced for London. At the Paris show several electric vehicles were on view, and for the most part it was apparent an attempt had been made to conform, so far as outward appearance goes, to orthodox motor-car practice; the Alba, for instance, wherein the motor was located amidships in the chassis, driving thence by shaft to a worm-driven axle. For an electric town carriage this car should prove popular. The greatest use of electricity was among the accessory exhibits, and the lamp makers are producing some very artistic specimens of their work.

There are over 350 exhibitors in the Olympia catalogue, and since the last show, in 1913, there have been some 40 newcomers to the field now covered by British motor manufacture. In the Main Hall, which is devoted to motor-car exhibits, there are 111 exhibitors divided between seven countries as follows:—Great Britain, 67; France, 24; America, 12; Italy, 3; Spain, 2; Holland, 2; and Belgium, 1. Of the British exhibitors a fair number appear to be newcomers; the French are mostly familiar names, while there are new names amongst the U.S.A. exhibitors. A feature of the show is the number of cars exhibited by British firms whose names were unfamiliar in the motor trade prior to the war. They are mostly recruits to the motoring industry from aeroplane and munition works.

Altogether there are 200 odd new models of chassis and complete cars exhibited, of which only about 25 cars are without self-starters. While there has been an interval of six years since the last show it cannot be said that the exhibition really represents six years' progress in motor-car engineering. Of the seven countries exhibiting five have been at war, and manufacturers have had their attention diverted from their normal work. As far as it is possible to judge from a brief survey, the principal changes in construction appear to be: almost universal adoption of electric lighting and electric self-starters; construction of engine and gear box as one unit; increasing number of six-cylinder models; improved springing of cantilever type; 4-wheel braking; improved coachwork; greater accessibility; and greater weight reduction.

One very important feature that is evident is the

triumph of the metallurgists. The saving in weight of some chassis, compared with 1913 and 1914 models, amounts to as much as 20 per cent. without loss in strength of the metal. This is a result of the experience gained in connection with the building of aeroplane engines during the war. One engine, rated at 40 H.P., is in appearance practically the same as the pre-war model, but is claimed to be actually 2 cwt. less in weight. Another firm has gone even further and has adopted what amounts to an aeroplane engine. The chief claim for this radial, air-cooled engine is in respect of lightness. Weight is saved by the elimination of radiator and water jackets, and by the arrangement of the cylinders a shorter and lighter crankshaft is used. Other advantages of decreased weight will be apparent. France is exhibiting a chassis for which remarkable claims are made; it is stated that the 8-cylinder engine is so flexible that the car can be accelerated from 5 to 50 M.P.H. on top speed within 15 seconds; that with the 4-wheel system of brakes the car when travelling at 50 M.P.H. can be brought to a standstill in 10 yards without any noticeable jolt; also that there is no undue vibration when the engine run free is accelerated up to 2,000 R.P.M. These claims, if justified, will certainly give the car a high reputation. Other foreigners of interest and distinction are the 12-cylinder Lancia and the wonderful new Hispano-Suiza, an automobile adaptation of the famous aero engine.

Incidentally, both the Talbot-Darracq and the Hispano-Suiza have boldly dispensed with the use of a magneto. Of what might be termed the cheaper "family type" of car one British model boasts an electric self-starter, and is comparable in price to the American Ford.

In both the car and accessories sections revelation of well-kept secrets is looked for. These will demonstrate that the British manufacturer has made good progress considering the difficulties that have been encountered since the armistice. In the manufacture of spark plugs, carburetters, lighting sets, self-starters, magnetos, and other components of the modern car, England is by no means behind the times.

(To be continued.)

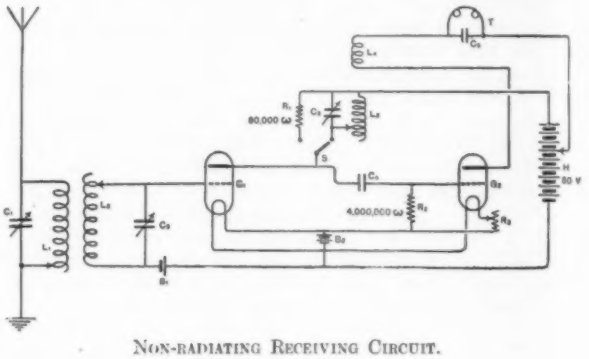
A NON-RADIATING WIRELESS RECEIVING CIRCUIT FOR THE RECEPTION OF DAMPED AND UNDAMPED WAVES.

By JOHN SCOTT-TAGGART.

The great increase in the number of transmitting stations employing continuous waves has made it desirable to employ wireless receiving circuits which are capable of detecting both damped and undamped waves, as may be desired. Many modern self-heterodyne vacuum-tube receiving circuits, however, possess a serious disadvantage in that they radiate from the aerial a steady stream of feeble continuous waves which interfere with other continuous-wave receiving stations within a few miles' radius. So serious is this defect that future radiotelegraphic legislation will probably forbid the use of such circuits. The present writer has effectively overcome the difficulty, and incidentally also obtained a greatly increased efficiency, by the use of a special vacuum tube. A simpler arrangement, however, is presented here, and has been designed by the writer for general wireless reception.

The circuital arrangement is shown in the accompanying figure. The aerial circuit contains a variable inductance L_1, shunted by or connected in series with a variable condenser C_1 of about 0.01 mfd. capacity. The closed receiving circuit consists of a variable inductance L_2 shunted by a condenser C_2, also having a capacity of 0.01 mfd. This closed oscillatory circuit is connected across the grid G_1 and filament of the first three-electrode vacuum tube. A cell B_1 may be used to give the grid a small negative potential, and thus lessen grid currents which are liable to cause rectification and damping. The plate circuit of the first vacuum tube contains the battery H and either the high non-inductive resistance R_1 (of about 80,000 ohms), or the variable oscillatory circuit L_3 C_3, according to the position of the two-way switch S. During reception, the high-frequency potentials across R_1 or L_3 C_3 are impressed on the grid G_2 of the second vacuum tube through the condenser C_4 of about 0.0003 mfd. capacity. The chief object of this condenser is to insulate the grid G_2 from the battery H, which would otherwise give the grid a very high positive potential. The second valve acts as a rectifier on the cumulative leaky-grid principle, the charge on G_2 leaking away through R_2, a non-inductive resistance of about 4 megohms. The resistances R_1 and R_2 may conveniently be fine grooves cut on ebonite sheet and filled with graphite by rubbing the point of a pencil across them. Suitable terminal connections are made at the ends of the grooves.

The plate circuit of the second vacuum tube contains an aperiodic inductance L_4 and a pair of high-resistance telephones T shunted by a condenser C_5



Non-radiating Receiving Circuit.

of about 0.001 mfd., which serves to by-pass the high-frequency component of the plate current of the second tube. The natural frequency of L_4 should be higher than that of the shortest wave-length to be received. The variable tapping on H enables the potential of the second plate to be adjusted to the most suitable value, which will usually be less than the voltage of the first plate. To obtain the optimum conditions for rectification, the filament current of the second valve is adjusted by means of a rheostat R_3 of about 5 ohms resistance.

The operation of the arrangement is briefly as follows: When the switch S is over to the left, the resistance R_1 is brought into action, and the oscillatory circuit L_3 C_3 is isolated. The device is now suitable for receiving damped waves, the only tuning required being that of the aerial and closed receiving circuits. It is consequently very suitable as a "stand-by" arrangement for "picking-up" signals. The switch S is now moved over to the right, and the oscillatory circuit L_3 C_3 is tuned to give the best results. The coil L_4 is now brought near to L_3 and the coupling tightened to produce retroactive amplification. With S to the right, continuous waves may be received by tightening the coupling between L_4 and L_3 still further until self-oscillation in the second vacuum tube takes place. The frequency of these locally-produced oscillations may be varied by adjusting C_3 and L_3. It will be readily seen that the first vacuum tube will allow received continuous waves to pass inwards while preventing the locally-generated oscillations from passing out to the aerial.

The oscillatory circuit L_3 C_3 should, of course, be kept as far away as possible from the aerial and closed receiving circuits.

We thus obtain an efficient arrangement for receiving both continuous-wave and "spark" signals, which is capable of speedy adjustment, and which does not radiate waves while in operation.

THE NEW CABLE STANDARDS.

By DONALD SMEATON MUNRO, M.I.E.E.

The newly issued standards are in many ways a distinct improvement upon the old methods of naming electrical conductors.

Those who are daily making use of the smaller cables will, for a time, use the new standards like a foreign language—translating each given dimension into the old familiar designations to obtain their mental picture of the size of a cable core. But as they become familiar with the new nomenclature this habit will cease.

It seems to the writer that it would be of much practical utility if the new series of round-wire gauges, now urgently required for the 12 standard sizes (including heavy and light flexible), were graduated in square mils. These would be more easily written and remembered. That is to say, beginning at 1 square mil instead of .001 square inch.

The diameter in mils might also be given for each of the twelve or the diameter measurements could preferably be left for the ordinary micrometer.

It would make for simplicity indeed if the new set of round-wires were designated in square mils with no allusion to diameters. The latter, being lineal figures, only increase the chance of error. There is not much fear of confusion with the American circular mils.

The working electrician would soon learn to identify his cables with the square mils in column 1 of the accompanying table. Let him learn also as a useful unit figure the ohms, and the weight, for a copper conductor 1 sq. mil in area and 1 ft. (or 100 in. or 1,000 yards) in length. When then he wishes to know the approximate weight of any cable, he has only to multiply its area in sq. mils by his unit of weight, and by the total length. Or if he desires to find the resistance, he divides his unit of resistance by the sq. mils and multiplies by the total length.

These little advantages are not to be despised. There may be some good reason why this course was not adopted in the newly issued standard tables, and it would be interesting to know what it is.

Users will greatly appreciate the statements of weight, ohms, and prices per 1,000 yards instead of per mile. It would have been going too fast if the Cable Makers' Association had attempted to introduce a decimal system of measurement of length at this stage; but one can foresee further future confusion due to this omission. If those who are considering the question of a British decimal system are agreed not to adopt the French metric standards, they would do much good if they would decide upon the unit standard of length. If it is to be one inch let us at once give a name to the 10, 100, 1,000, 10,000, and 100,000 in. multipliers thereof. Then our wire tables could take permanent form, and we would avoid a procedure by steps each of which involves the maximum of disturbance of our mental habits. The yard is not likely to be a future British measure, and so "1,000 yards" is itself a passing phase, soon to be unlearned. Some of the cable makers in the new lists give a column for the diameter of each wire and another for diameter of the strand. Is not this a wrong and therefore confusing use of the word "strand"? Strand suggests the part rather than the whole.

Attached is a comparative table giving the old standards and the new, approximately, as suggested above.

New standard.		Old standard.	
Approx. nom. area in sq. mils of complete conductor (also amps. at 1,000 per sq. in.).	Number and nominal area in sq. mils of wires composing conductor.	Number and S.W. gauge of wires in conductors.	Old nominal area in sq. mils of complete conductor.
1·0	1/1·018	1/20	1·0
1·5	1/1·521	1/18 & 3/22	1·8
2·0	3/0·660	7/25	2·2
3·0	3/1·018	3/20	3·0
3·0	1/3·217	1/16	3·2
4·5	7/0·660	7/22	4·2
7·0	7/1·018	7/21½	4·9
10·0	7/1·521	7/20	7·0
14·5	7/2·124	7/18	12·5
22·5	7/3·217	7/16	22·1
40·0	19/2·124	19/18	33·8
60·0	19/3·217	19/16	60·0
75·0	19/4·072	19/15	75·0
100·0	19/5·410	19/14	93·7
120·0	37/3·217	37/16	116·8
150·0	37/4·072	37/15	150·0
200·0	37/5·410	37/14	182·4
250·0	37/6·790	37/092	250·0
300·0	37/8·332	37/104	300·0
400·0	61/6·790	61/092	400·0
500·0	61/8·332	61/104	500·0
600·0	91/6·790	61/112	600·0
750·0	91/8·332	91/101	750·0
1,000·0	127/8·332	127/101	1,000·0

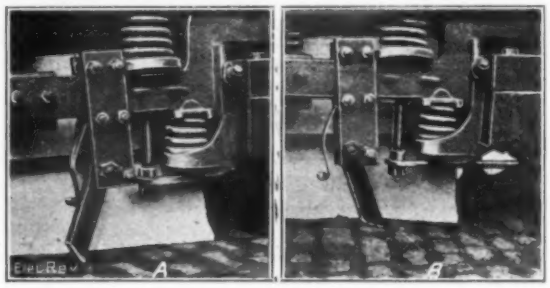
NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

A Back-Running Brake.

Mr. R. Humphries, chief engineer to the Birmingham and Midland Tramways Joint Committee, Downing Street, Smethwick, has designed and protected a brake primarily for the above purpose, but which has other virtues, and can be used to stop a forward runaway if and when applied from the rear end. Fig 1A shows a truck attachment, fitted on the entrance side at the diagonal ends of the car, and shows the leading end of a car climbing a grade with the brake dropped and trailing, also holding a car from running backwards.

Fig 1B shows the position taken up if dropped with the



Figs. 1 A & B.—Humphries Back-running Brake.

car at speed. The dog then assumes a vertical position and becomes a powerful slipper brake, rapidly bringing the car to rest; as soon as the car is made to move forward it automatically assumes position "A" when it can either be left trailing or lifted.

It will be seen that this brake is practically automatic, independent of sand, current, muscular effort, electrical contacts, or condition of rail. The platform attachment is a self-locking throw-over handle attached to the dash, and its full benefit can be obtained in a moment. A stranded steel rope attaches the operating handle to the brake, and the latter can operate only on what is for the moment the rear end of the car, so that it is "safe." A safety chain is fitted on the dash handle to prevent unauthorised use.

As a trailing brake in hill climbing, its use is at once apparent, as it will hold a car at rest on a grade *without* the

hand brake. The car wheels can then at once revolve when current is applied. Thanks are due to Mr. Johnson, resident engineer, Smethwick, for photographs.

A New Submersible Electric Pump.

There are few problems relative to pumping apparatus for ship's use that have received greater attention during the war than that of the possibility of keeping a ship afloat after she has been badly holed by mine or torpedo. It is obvious that if a compartment is badly damaged, no pumping apparatus would keep the water out. It is, however, quite within the range of possibility that the compartments adjacent to those damaged may be kept free from water, providing apparatus is ready for instant use in such an emergency. On several occasions, when a ship was mined or torpedoed near shore, she could have been beached had it been possible to keep the water out of only slightly damaged compartments for a few hours.

The portable electric pumping apparatus here illustrated has been specially designed and constructed by Messrs. Merryweather & Sons, Ltd., Greenwich Road, London, S.E. 10, to meet such requirements as necessitated by the conditions indicated above.

At the present time there is probably not a ship of any size at sea that is not equipped with an electrical installation for lighting purposes, and such vessels as those owned by the White Star line, are provided with a special power plant carried on the upper deck, entirely separate from the ordinary ship's lighting set in the engine room. This special power plant is, we believe, rendered compulsory by the Board of Trade to meet the regulations laid down by the Convention for the Safety of Life at Sea promulgated prior to the war.

Should the vessel be damaged in the vicinity of the engine room, and the dynamos put out of action, the emergency plant would come instantly into operation, and provide energy for lighting, for operating the ship's derricks, and for driving such a portable pumping apparatus as that which forms the subject of this article.

The Merryweather electric submersible pump, fig. 2, consists of a centrifugal pump of the firm's standard sea salvage type, coupled direct to an electric motor carried in an hermetically sealed steel cylinder. A special feature of the apparatus is an intersepting chamber arranged between the motor and pump, forming subject matter for which a patent has been applied, and which is designed to prevent any possibility of water from the pump chambers finding access to the electric motor. A continuous working test of 48-hours' duration with the pump completely submerged has failed to show the slightest leakage of water into the motor cylinder.

The Merryweather submersible pump can be successfully operated direct from an ordinary ship's lighting set. The pump illustrated, of which a large number is being supplied for the new tonnage of the White Star line, has an 8-in. diameter suction, and is capable of giving an output of 1,100 gallons per minute against a head of 35 ft. An overall efficiency of 75 per cent. has been demonstrated by actual test.

These pumps can be operated when slung vertically or when fixed in a horizontal position either on or off the trolley with

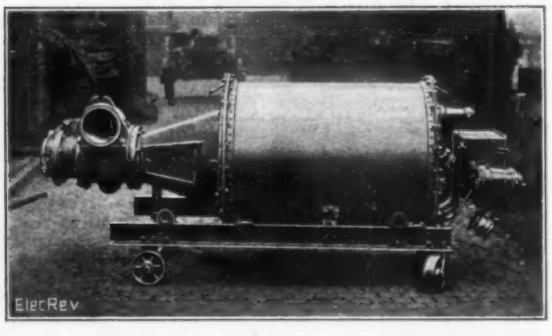


Fig. 2.—Merryweather's Submersible Electric Pump.

which each is supplied. Although these pumps will run successfully when totally submerged, they will run equally well when fixed above the water level.

The possibility of a rapid rise flooding the pumps has necessitated constructing them in such a manner as to allow of their continuous operation under the most adverse circumstances.

The power-cable connections are, of course, watertight, and are arranged with a swivelling nut much in the same manner as a standard screwed hose coupling. Each pump is supplied with a hand-operated air pump fixed to the carriage for charging pump suction when operated from about the water level.

It will be remembered that Messrs. Merryweather constructed a smaller-size pump on the same lines as those described above as a portable appliance for use on the salvage steamer *Hercules* of the Austro-Hungarian Navy many years prior to the war, in addition to the whole of the pumping equipment of that salvage boat. A demonstration of the new pump, which is approved by the Board of Trade, was made recently at Greenwich.

THE FRASER & CHALMERS ERITH WORKS

As briefly announced in our last issue, the Press visit to the Fraser & Chalmers engineering works at Erith, Kent, on the 3rd inst. was a highly successful affair. The morning was spent in an interesting and instructive tour of inspection of the works, after which an excellent luncheon was served, at which Mr. Hugo Hirst, chairman and managing director of the General Electric Co., Ltd., presided.

Fraser & Chalmers, Ltd., was formed as a public company in 1890, with the particular object of constructing works in this country for the manufacture of machinery for metalliferous mines and metallurgical works. Work was commenced on the building in 1891, finally getting well into running order in 1893. The later developments of the company were in connection with more or less allied lines. The General Electric Co., Ltd., took over the works in April, 1918, and complete reorganisation from war conditions has now been made, with a view to concentration upon the production of turbines, turbo-blowers, turbo-compressors, conveying, transporting and unloading plant, mining machinery, winding engines, gas cleaning plant for blast furnaces, rolling mill equipment and general engineering. Considerable extensions are being made to the shops. The works cover an area of about 18 acres, situated close to the River Thames, within 14 miles of London, and are within easy reach either by river, road or rail of all the principal London goods termini and docks. The main offices are adjacent to the shops, and in normal times over 2,000 employés are engaged in the production of finished machinery, aggregating approximately 800 to 1,000 tons per month.

The electric power generating station is of up-to-date design inasmuch as the whole works are electrically driven. The boiler house is equipped with water-tube boilers by Babcock & Wilcox, working at 175 lb. per sq. in., fitted with chain grates. The coal is fed by an F. & C. belt conveyor into an overhead hopper, and it automatically descends by gravity into the furnaces of the boilers. The turbine, to which is coupled direct a G.E.C. 1,500-kw., 3-phrase, 50-cycle alternator at 3,000 r.p.m., is of Fraser & Chalmers' manufacture. There are two G.E.C. rotary converters, electrically coupled in parallel, running at 500 r.p.m., producing d.c. at 440 volts. The switchboard and gear was also supplied by the G.E.C.

The smiths' shop is well equipped with steam hammers, sawing and cutting-off machinery, and is adjacent to the main general machine shop; this department has also an oil-fired annealing furnace.

The foundry is composed of two main bays measuring 360 ft. by 155 ft., and is situated approximately in the centre of the works and adjacent to the main railway sidings. The entire length of these bays is covered by six 25-ton electric overhead travelling cranes. The department is also well equipped with large and small jolt ramming machines and pneumatic moulding machines for repetitive work. The whole of the sand mixing and other machines are electrically driven and Piftin hot air mould-drying machines are also installed. The company provides for high grade castings up to approximately 35 tons weight.

The boiler and plate shop has been equipped for the manufacture of boilers, mining plant, gas-cleaning and conveyor-plant structural work, furnaces, &c., and is fitted with pneumatic tools for caulking and riveting in addition to the hydraulic presses and riveting installation. It is also equipped with oxy-acetylene and electric cutting and welding plant, and special machines for dealing with perforated plates and tank work, such as large shears, rolls, &c.

The general engineering shop is arranged for the manufacture of large winding engines and air compressors, both steam and electrically driven, also fixed large steam engines for mill and factory driving, and various classes of mining machinery and general engineering. It is well equipped with overhead cranes up to 25 tons, also large boring, turning, planing and slotting machines. Adjacent to this department is the works' tool room.

The turbine department, designed and fitted for the manufacture of large steam turbines, turbo-blowers and turbo-compressors, is equipped with boring and turning mills, planing machines, lathes, presses—for forcing the shafts into the rotors of turbines—balancing machinery, &c. It is the firm's custom to erect and test every machine in this department before dispatch. In order to do this satisfactorily a considerable number of test beds have been built with the necessary condensing plant underneath. On either side of this shop there is a gallery, one of which is entirely devoted to the manufacture of blades for turbines, which involves much labour and expense, including special machine tools and methods, jigs, tools, &c. The other gallery is devoted entirely to the assembling, riveting and finishing of wheels for turbines and blowers. Special electrical heating devices are installed in this department so as to ensure satisfactory riveting of the bands on to the ends of the blades.

The wood-working department is contained in a separate block of buildings and comprises the carpenters' shop, pattern shop and storage. The ground floor is occupied by the carpenters, on which is installed all machinery such as frame saws, planes, morticing and other machines necessary for the manufacture of mining and other plant. The pattern shop is on the first floor, adjacent to the drawing office. It contains

labour-saving devices, such as Wadkin pattern-making machine, disk grinder, band and circular saws and planing machines. In close proximity to this shop is the pattern storage, fitted with a very complete arrangement of racks, the whole of which are numbered, and a complete card index file is kept of all patterns. The whole of the different working departments are fitted with sprinklers in the event of fire.

The conveyor and gas-cleaning departments are fitted with the necessary tools and machines required for the manufacture of belt conveyors, grab transporters, gas-cleaning plant details, and idlers for conveyors, the demand for which has necessitated the building of a new shop adjacent to the existing building.

At a period when the steam turbine was in its elementary stage, Messrs. Fraser & Chalmers decided to develop the Rateau impulse type steam turbine, and were the first British firm to take up its manufacture in this country. The present production includes the aforementioned type, in standard sizes, ranging from 500 KW. to 30,000 KW. per unit, designed for the highest steam pressures and superheats, and for every class of power production. Many special features are embodied in design and construction, including F. & C. (patented) mixed pressure turbine governing gear. A typical unit now under construction for the Glasgow Corporation is a high-pressure machine with a normal capacity of 15,000 KW. and overload up to 23,500 KW. running at 1,500 R.P.M., and designed for divided flow in the low-pressure stage.

The General Electric Co., in connection with the Witton works, has unique facilities, and will particularly specialise in the manufacture of complete turbo-generating plant.

The manufacture of mining machinery dates back to the formation of the company. The F. & C. magnetic separator, suitable for dealing with feebly magnetic ores such as wolfram, monozite, &c., is of the improved crossbelt type; rheostatic adjustment allows for five different products being obtained in a single operation.

Electrically-driven winders employ A.C. and D.C. motor drives, direct coupled or geared to parallel or cylindro-conical drums, and in all cases equipped with F. & C. Whitmore (patented) brake engine and overwinding device, steam or air operated. All types of electrical control are manufactured at the G.E.C. Witton works.

The original dry gas-cleaning plant was started in Germany in 1912; operations were, however, begun on a small scale in this country. In 1914 a large plant was erected at the North Lincolnshire Ironworks. Thorough researches were undertaken at the works of the North Lincolnshire Iron Co., Ltd., and the fact was very soon determined that by certain special processes the yield of potash could be increased sometimes as much as 200 per cent. It is interesting to remember that during the year 1916 this particular plant was the only available source in this country for the potash used in the manufacture of optical glass. It is estimated that in the ordinary course each million tons of pig iron produced carries with it potential potash to the extent of from 15,000 to 30,000 tons, and that 200,000 tons of potash are fed into the blast furnaces of England every year. One quarter of this total, or 50,000 tons, is volatilised and carried from the furnaces in the shape of gas; four-fifths of this 50,000 tons escape into the atmosphere—wasted.

By the addition of salt to the charge of an ordinary blast furnace producing pig iron a chemical change takes place which renders more potash available in the gases that rise from the white-hot mass, and increases the amount from 5 to 80 per cent.

Apart from potash recovery, the gas itself is of extreme value. It can be used for running power stations and factories, for heating purposes at steel works, or for many familiar industrial operations, and taking into consideration the number of blast furnaces in the country its importance in the national scheme for cheap power and economy of coal becomes incalculable. A saving of 40 per cent. in the coal bill of a steel works is a very great consideration.

For the manufacture of dry gas-cleaning equipment in this country the F. & C. works, Erith, are the sole licensees. Six of their plant are now in full operation, and four of them have had extensions installed. These plants represent a total capacity of over 30,000,000 cu. ft. of gas per hour, or about 35,000 tons of dust per annum, containing at a moderate estimate twenty-five or thirty per cent. of potash, bringing the total potash production up to 9,000 or 10,000 tons each year without the introduction of any special process in the furnaces. By adopting the methods of the North Lincolnshire Iron Co. this yield could probably be increased by from 100 to 200 per cent.

The value of this new process to the country's welfare was fully realised by the Government. Twenty complete installations of dry gas-cleaning plant were ordered from Fraser & Chalmers during the period of hostilities. The recovery of potash is of value not only in the manufacture of fine optical glass, but it has unrivalled properties as a fertiliser in agricultural work.

The works during the war period were fully occupied on the standard lines of turbines and turbo-blowers. The conveyor department installed plant not only for Government purposes in this country but also for the Allied Governments. A large transporter plant was erected at Rouen, another at Dunkirk, while a very large plant was completed for Durban Harbour for the shipment of coal for Admiralty and other purposes. The extraction of potash from the dust deposit by the dry gas-cleaning process provided a means of safeguarding the supply of this very necessary article, and the Government was quick to take control of the manufacture and use of such plant. The other staple products of the company for mines and metallurgical works were also in demand, but entirely apart from standard manufactures a large amount of purely war work was successfully undertaken for the Admiralty, War Office, Ministry of Munitions, and other contractors. This included the erection of Diesel engines for the Admiralty, together with the supply of the various parts of these engines; a considerable amount of buoy work for the Admiralty and Port of London Authority; trawler engines for both the British and French Admiralties; pontoon boats, armoured cars, heavy gun parts, shell dies, cast-iron chemical shells, the erection and re-conditioning of guns and the supplying of parts and fitting up of a number of the earliest caterpillar tractors. With the advent of the armistice, however, immediate steps were taken to close down on any unnecessary work of a purely munition character, and the shops were speedily transferred from a war to a peace basis.

Our thanks are due to Mr. Lewis, works manager at Erith, and Mr. H. Clifford Palmer for the particulars and illustrations given above, and also to other members of the staff who so courteously conducted the visitors over the works.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Utilisation of By-Products.

As extensive developments in the electrical world are foreshadowed in the near future, is it not time our engineering experts concentrated their energies on the above subject?

Clearly, from an economical point of view, a modern steam-driven power station is a dead loss to the community compared to a gas works in the value of its products. Perhaps some prejudiced individuals will contradict this. A form of engine on the lines of the Still gas engine would, in my estimation, meet the case.

Economy.

November 5th, 1919.

The Value of the Rupee: A Warning.

I notice firms are advertising in your paper for men for India. The salaries are given in rupees, and an equivalent is given in £ sterling. This is very misleading. The purchasing power of the rupee in India has fallen considerably, owing to the rise of prices here as elsewhere. Rents have risen in many cases 50 per cent., food 25 per cent., servants, &c., above the normal. Firms who give this sterling equivalent must know that the salaries will mostly be spent in India and not sent home.

Calcutta.

October 16th, 1919.

Stopping a Runaway Tramcar.

With reference to Mr. W. G. Stuart's letter in the "Notes" column of the ELECTRICAL REVIEW of October 31st, there are four methods in general use for stopping a tramcar, viz.:—

First method.—By means of the mechanical brake.

Second method.—By means of the magnetic or rheostatic brake.

Third method.—By pulling the reversing lever to the reverse position and applying power to the motors in series, thus tending to reverse the direction of rotation of the motors.

Fourth method.—By throwing out the canopy switch or circuit breaker and bringing the controller handle to the "parallel" position, after it is found that the third method fails to act, the reversing lever being still in the reverse position.

In using the fourth method it is immaterial whether the controller handle is on the first, second, third, or fourth notch. The braking effect will be the same in each case, as the resistances take no part in the braking action. The motors become series generators in parallel—an unstable combination—and one overcomes the other, driving it as a motor in the reverse direction.

When applying the second, third, or fourth methods the mechanical brake should be released, and in the case of a runaway car, or when it is necessary to make an emergency stop, the track should be sanded.

The third method will not act if the trolley has left the wire, and it is then only necessary to bring the controller handle over to the "parallel" position.

E

Mr. Stuart states that the fourth method will work if the wheels have left the track. I am afraid that in this case nothing less than a substantial stone house, or its equivalent, will have much effect if the car is travelling with any speed.

J. R. Fletcher, A.M.I.E.E.

Hamilton,
November 5th, 1919.

Speeding-up of an Induction Motor.

I had installed about 12 months ago a 40-H.P., 400 volt, 50 cycle, slip ring, induction motor, and until a few weeks ago it worked satisfactorily. It then suddenly increased its speed by about 20 per cent., and nearly wrecked the machine to which it was belt coupled.

This motor is supplied from the Corporation mains, but no other motor fed by the same feeder shows any signs of speeding up. Could any reader kindly explain the behaviour of this motor, or state any similar case that has come to his notice?

Eventually we had to fit a smaller pulley to the motor shaft, to reduce the drive to its original speed. The motor has never even blown a fuse, or tripped the control breaker, and I think this is rather an unusual case.

Puzzled.

November 8th, 1919.

Coil Ignition v. Magneto Ignition.

I read with much interest the article on the above subject which appeared in your last week's edition.

The writer asserts that coil ignition is now to be preferred to the magneto, and goes on to give six very good reasons in support of his contention. They certainly read well on paper.

He then refers to the "Remy" being fitted to a certain aero engine which was originally designed for two magnetos.

I happen to have had quite a considerable amount of experience with the engine referred to, both at home and overseas. I must say that the Remy proved most unsatisfactory, and was never to be relied upon. It certainly never replaced the magneto, which was always reverted to (although contrary to orders) by squadrons overseas when they could procure the necessary L.H. magneto, coupling, &c. I might also mention that our losses with this particular engine and ignition were always very high, and much above those with the engine and magneto which superseded it in the same machine. The engine in question was a six-cylinder vertical type, water cooled, and developed about 240 H.P., and naturally had a very large bore and stroke and very high compression. If when testing the magneto were cut out and the Remy allowed to "function" alone, the engine immediately commenced "staggering," and very often cylinders would cut-out. This was particularly noticeable when the sparking plugs had seen a little service, which, of course, was the case when a machine was well over the enemy's lines, a matter of a few hours' flying.

The cause of this failure, I believe, was the fact that the intensity of the Remy spark under compression was poor, and nothing compared to the magneto. Possibly the very high compression of this engine would account for a lot.

The writer then refers to the Liberty engine, with its similar coil ignition. I had very little experience with this engine, but one of the first to reach this country came into my hands. The first trouble we had, which occurred after about a day, was ignition trouble.

From my experience, of aero engines at least, I can safely say that coil ignition does not yet equal the magneto, although I certainly believe it has a future.

C.G.M., A.M.I.E.E.
Late Warrant Officer (E.), R.N.A.S.

London, S.W., *November 8th*, 1919.

New Standards for Cables.

Permit me to comment briefly on Mr. Geo. T. Smith's letter in this week's Electrical Review.

Taking his remarks seriatim, surely he does the non-technical customer a little less than justice. If this individual has enough technical knowledge to specify any size of conductor to be used in his installation, he will certainly know that .029 is less than .036, in the same way that he knows ⅛th of a yard is less than 1 yard. Sizes are quoted in actual diameter quite as frequently as in S.W.G., and it will certainly be less confusing when everybody can "think" in actual diameters. The S.W.G. is, after all, only an actual diameter with another name.

Also I think Mr. Smith underrates the average wireman's ability. I know many who possess their own micrometers, and who can use them accurately. They usually take far more care of them than they do of their watches. I once saw a man in a generating station using a plate form wire gauge to set a saw!! (Two marks, please, Mr. Editor.)

The work of the British Engineering Standards Association is carried out by men whose ability will not, I think, be questioned by Mr. Smith even. They, in their wisdom, have decided that actual diameters shall be used in giving sizes of conductors. The values in the report issued by them last July and previously in 1910 are given in terms of 1,000 yards. All Admiralty and War Office cables are in 1,000 yards' lengths (or multiples of the same), and anyone measuring up for a tender will quickly find that his work is considerably less using the easily divided 1,000-yard unit than the more cumbersome mile.

I am afraid Mr. Smith has not kept up with the times in his life study of the profession. Any up-to-date engineers, either mechanical or electrical, will tell you that they would welcome the metric system with open arms. It is certainly better and easier for computing small measurements, with which most of us are already familiar, and in a very short time 880 mm. would be as significant to us as 3 ft. 6 in. is now.

Contrary to Mr. Smith, I would advise all concerned to get down to the business of thinking in terms of 1,000 yds. instead of the mile, and place their orders accordingly. They will quickly appreciate the advantage of the change, and incidentally will find themselves able to put a lot more mental arithmetic into their estimates and calculations.

In conclusion, sir, I think you will agree with me when I say that the balance of contractors of known and tried integrity far outweighs the unscrupulous ones feared by Mr. Smith, and any such dishonourable practice as he mentions would be quickly stamped out by the members of the profession themselves in their own interst.

S. E. G.

London, S.E. 7,
November 7th, 1919.

The Troubles of an Advertising Manager.

I am grown desperate, and since of my own ingenuity I seem unable to find a happy issue out of my afflictions, I am appealing to you for guidance in a matter primarily of business, but involving also questions of right conduct and even of social morality. Let me explain.

A year ago I wrote an article entitled "The Troubles of an Ad. Man." The same title would serve for this present communication, though my woes are not the same; not as they then were, small, remediable defects of internal organisation, but mighty influences, apparently ineradicable, and going down to the very heart of our commercial life.

Since the conclusion of the war, the number of publications has increased beyond computation. Each of those publications has upon its staff a live, enterprising, energetic, and persistent advertisement representative, and to each of those agents there appears to come a moment of inspiration, something like this: "Bennis's are believers in the only true gospel: They are firm and steadfast in the faith: They advertise largely and well. I will fare forth and book their order, and thus shall my commission be increased and my economic salvation be assured." But as a firm specialising in certain branches of engineering, there are very few publications beyond those in which we have been consistently advertising for years, in which we are likely to be interested, and the net result is that almost every one of my working days is reduced in value by half, and sometimes more; the time which I am paid to give to creative work and the time which they might spend elsewhere to good effect, is wasted in interviews the result of which is known (to me) beforehand, and the routine work of the office is disturbed by constant attention to their calls; in showing them in with hope, and ushering them out in despair. I have just seen the last of five such callers, and shall consider myself fortunate if I am able to pass the remainder of the day in peace.

For some time I adopted, with some violence to my conscience, the polite fiction of being "out," but that produced a crop of evils even worse than before. In vain did my faithful assistant interpose herself between me and my pursuer; in vain did she risk her immortal soul in "telling the tale." Pertinacity is the very essence of success, and if he is not in now peradventure he will be in anon, in the morning, early, oh! so early, or "I will wait a few minutes in the hope of his return." Equally useless was it to try and cut short the interview with an early refusal. The opposite result ensued. All the combative instincts were immediately aroused. Every argument had to be marshalled; every selling point paraded, enforced, and reinforced, with examples and precepts and great wealth of detail.

One of my visitors to-day was the representative of a "gingering-up business" journal, with lots of "push" and very little "go," whose Yankeeisms stink in my nostrils, and from whom I receive every ten days or so an envelope marked in facsimile handwriting "personal" or "please reply by Thursday" (I have grown "wise" to these dodges, and do not trouble to look inside). He would not give his name. It was a personal matter, and he had, it appeared, an appointment with me. It is comparatively easy to deal with such if one has the courage to say: "By refusing your name and purpose, and under the pretence of having an appointment you have gained admittance to the presence. Now, if you don't appoint yourself to the other side of the door with the speed of a panther bounding over the prairie in search of its prey, I will appoint myself your conductor in strict

accord with the rules laid down by the Marquis of Queensberry, and though your weight in avoirdupois be more than mine, I shall nevertheless succeed in my purpose, for my strength shall be as the strength of ten because my cause is just."

But there are others, and most difficult of all, the really cultured representatives of technical journals, many of them practical engineers of experience and standing, men whom I met yesterday at a technical gathering and shall meet to-morrow at a social function. To be rude is not in my power; to refuse to see them is to risk giving offence to someone whose goodwill I am anxious to retain; to show too much interest is to raise hopes which are doomed to disappointment; to show too little is like a personal affront.

What to do I know not. Yet something must be done, for the essence of business is to save time, and how much time is wasted in this fruitless fashion no one knows who has not experienced it. If the present cumulative process continues, all my time will be spent to no purpose, and the real work which I am paid to do will remain for ever undone, or must be done by other hands than mine, and industry will be burdened with one more unproductive consumer.

Can you in the plenitude of your wisdom and experience suggest some way of saving this appalling waste of time and energy?

A Worried Advertising Manager.

The Improvement of Power Factor.

I should like through the medium of your columns to express regret that, as I was not aware that Messrs. Sandycroft, Ltd., were makers of the "Kapp" phase advancer, their name was not mentioned under this heading in my article. I am very interested and pleased to hear that this firm is making good progress with this particular type of condenser.

E. W. Dorey.

London, W.C., *November 10th*, 1919.

We have received a letter from "Ex Don-Ak-R," and would draw the writer's attention to the note at the head of this column.—Eds. Elec. Rev.

THE ELECTRICITY SUPPLY BILL.

On Thursday, October 30th, Standing Committee B continued the consideration of Clause 11 (powers of district boards in respect of the supply of electricity), and amendments were made requiring the Board of Trade to have regard to the terms upon which authorised distributors and power companies, as well as the district boards, were willing to supply, and the terms upon which they were themselves supplied by the board. The clause as amended was adopted, and Mr. Neal then moved that the consideration of Clauses 12 and 13 be postponed, on the ground that their adoption would work injustice to statutory undertakings, and that the position ought to receive careful consideration, in order that substantial agreement might be arrived at. Mr. Marriott supported the motion, which, he said, was intended to enable a reasonable compromise to be found. Eventually the sitting was adjourned for this purpose.

On Tuesday, November 4th, Clause 12 (transfer of undertakings to boards) was considered, and the discussion of various proposed amendments occupied the whole of the sitting. On the following day the Home Secretary moved to insert a new sub-section :—

"(4) Where by virtue of this Act any generating station or main transmission line belonging to a company or person being authorised distributors is vested in a district electricity board, that board shall if so required by the company or person within twelve months from the date of vesting purchase the whole of the remaining part of the undertaking of that company or person upon the terms of paying a sum equal to the amount certified by an auditor appointed by the Board of Trade to be the amount of capital expenditure on the whole undertaking properly standing in the books of the company or person, less any sum paid or payable as purchase money in respect of any generating station or main transmission line so vested as aforesaid."

Various proposed amendments to this sub-section were rejected, and after the period of "twelve months" had been replaced by "two years," the new paragraph was adopted. The clause was passed as amended, and the committee proceeded to consider Clause 13 (special provisions as to power companies). The Home Secretary moved to insert a new sub-section :—

"(2) Where a generating station of a power company is, by virtue of this Act, vested in a district electricity board the date fixed for the vesting thereof shall not be earlier than one year after the Order constituting the board comes into operation, and if within that year the power company so require the district electricity board shall purchase the whole of the undertaking of the power company upon the terms of paying to the power company the fair market value of the undertaking as a going concern at the date of the constitution of the district electricity board, that value to be determined in default of agreement by arbitration in accordance with the Arbitration Act, 1889, and no part of the undertaking of the power company shall vest in the board until the completion of the purchase.

"For the purposes of this sub-section the undertaking of a power company shall be deemed to include the undertaking of any subsidiary company which is under the control of the power company whether by reason of the majority of the voting power being vested in the power company or their nominees or otherwise, as is operated in connection with the undertaking of the power company.

"If the area of supply of the power company (including the area of supply of any such subsidiary company) is situate partly in one electricity district and partly in another, each district electricity board shall purchase the part of the undertaking within its district at the same time, and if the price is referred for determination by arbitration shall be determined at the same arbitration, and the amount to be paid to the company shall be apportioned between the district electricity boards in such manner as the Electricity Commissioners may think just."

Clause 13 as amended was approved, and at the afternoon sitting Clause 14 (power to confer powers on boards when authorised undertakers unable or unwilling to give facilities), with minor amendments, was passed. Clause 15 (subsidiary powers of district electricity boards) was taken up, and an amendment providing for the recovery of penalties for infringement of the conditions laid down in the order of the Board of Trade authorising the abstraction of water from a river or canal was passed against the Government. Amendments safeguarding the rights of former owners of a generating station to plant contained therein which remains their property, ensuring that land required for generating electricity by water power shall be included under the compulsory powers, and providing powers for the erection of plant for recovering and utilising by-products arising out of the production of electricity, were made and the clause was passed.

On November 6th the Committee considered Clause 16 (mode of exercise of powers of district boards); an amendment was inserted providing that in the event of the duties of the district board being delegated to authorised undertakers, a "special order" should be required. Commander Dawes moved to omit the words allowing the duties to be delegated to a company established for the purpose, and this was carried against the Government, together with sub-section (2) which provided for the lease of undertakings. The clause as amended was then adopted. Clause 17 (compensation for deprivation of employment) was discussed, and the date from which the five-year limit was to commence was fixed as May 8th, 1919. Further amendments were made, greatly widening the scope of the protection afforded, and requiring the payment of the compensation awarded by a referee or board of referees instead of leaving it to the discretion of the Ministry of Labour. Words were inserted defining the basis of compensation as in the Transport Act, and the clause was passed. Clause 18 (submission of plans, &c.) was adopted, and Clause 19 (power of the Board of Trade to construct interim works) was discussed at considerable length. After amendment the clause was adopted. Clause 20 (power of authorised undertakers to render mutual assistance to one another), Clause 21 (transfer of powers of certain departments), Clause 22 (overhead wires), and Clause 23 (wayleaves) were also amended and passed.

LEGAL.

Electrical Superintendent's Libel Action.

At Glamorgan Assizes, at Cardiff, J. W. Barnett, formerly electrical superintendent to the Neath Rural District Council electrical generating station, brought an action for damages against G. H. Thompson, the manager of the station, for alleged libels in letters written to the Dockers' Union.

Mr. Marlay Samson, K.C., for the plaintiff, said that when the latter was looking for a new position the defendant, in October, 1917, gave him an excellent testimonial, stating that he always found him "most trustworthy, energetic, and sober, well fitted to hold a more responsible position." In March, 1918, the plaintiff was dismissed without notice. The alleged libel was contained in a letter written by the defendant to the secretary of a branch of the Dockers' Union, in which it was stated that a number of workmen had represented to the Rural District Council that Barnett's behaviour had been abusive and insulting, and that his manner towards them was of a bullying character. It was submitted that the plaintiff's dismissal was brought about because he gave offence to his superior officer.

After evidence had been given, the judge directed the jury that the sole question they had to decide was as to whether the defendant was actuated by malice when he wrote the letter referred to.

The jury, after an absence of a quarter of an hour, found a verdict for the defendant.

Ohlson v. Cowpen Coal Company.

Before Mr. Justice Lawrence, at the Newcastle-upon-Tyne Assizes, on November 7th, a claim for damages was brought by Carl Alfred Ohlson, of Blyth, Northumberland, against the Cowpen Coal Co. in respect of the plaintiff's son, George Andrew Ohlson, aged 16.

Mr. C. P. Scott, for the plaintiff, said that the boy, who was a pony driver in the New Delaval Colliery, on the premises of the Cowpen Colliery, was on his way to work on the morning of December 7th, 1918, when he was killed by electric current from a wire, and that, it was contended, constituted a hidden danger, for which the defendants were liable. Along the railway, which was a short cut, frequented by workmen, were standards supporting a high power electric cable, as well as telephone wires beneath. In December some repairs were being made to the telephone wires, and on the morning of the fatality a telephone wire was left hanging in large spiral loops to the ground, close to the path. The boy was walking with others, and noticed this wire; he took hold of one of the loops, and immediately cried out in pain, and called to his companions to pull him off. One of the boys took hold of Ohlson's boot, and he at once received an electric shock, and was afraid. The boy Ohlson shouted out "I am dying," and the boy with him shouted for help, and some men came. One of them, a miner, took off his leather cap and placed it on his hand, and seized the boy by the hook in the back of the boy's belt and pulled him off. The boy, however, was dead. If he (counsel) could not prove that the boy had a legal right to be on the track he could prove that it was habitually used by a large number of workmen, and no effort had been made by the defendants to prevent the use of it. There was no notice forbidding persons to use the path.

A boy named W. Gaff said he saw the wire hanging down on the evening before the fatality, and it burned his coat sleeve which brushed against it.

C. Bewick, another boy, said he saw sparks when Ohlson pulled the wire.

T. H. Davidson, a third boy, in cross-examination, said Ohlson took hold of the wire first with one hand but nothing happened. Then Ohlson took hold of it with both hands, and gave it a little pull. Witness then saw sparks on the wire overhead, and Ohlson fell.

J. Wilson, a stoneman, employed at the defendants' Cambois Colliery, said the railway had been used daily by men and women, and one part of it was practically a children's playground.

Mr. Lowenthal said there was no evidence to show that the boy was anything but a trespasser. It was sought to establish legal licence, without any evidence being given connecting the defendants with the alleged user. Even if there were such legal licence there was no evidence of breach of duty.

Mr. Scott argued that the habitual use of the railway by pedestrians constituted a user as licensee. There was in the wire a concealed danger. It was a live wire the night before the accident, and counsel suggested that there was contact when it was disturbed by the boy, and that accounted for the sparks.

His Lordship expressed the opinion that there was no evidence to go before the jury, but he would leave that for the jury to decide.

Mr. Lowenthal pointed out that when the man Brown came on the scene, he asked how the accident happened, and Bewick said Ohlson was swinging on the wire. As a matter of fact there was no current when the lad first handled the wire, but it would be the most simple thing conceivable for contact to be caused by swinging the telephone wire.

F. Imeson, electrician at the Isabella Pit, Cowpen Colliery, said the telephone wire had been secured to the standard, and must have been tampered with to bring it into contact with the cable.

B. Brown, overman at the colliery, said Bewick told him that Ohlson had been swinging the wire.

His Lordship said the jury, to find that the boy was a licensee, must be satisfied that the defendant knew that the railway was regularly used by pedestrians, and that the company permitted it. They must also decide whether the wire was a concealed danger before the boy touched it. The last question was: Did the defendants negligently leave it in a position as a concealed trap?

The jury found that the boy was a licensee, but that the wire did not constitute a concealed danger, nor was there any negligence on the part of the defendants.—Judgment was accordingly entered for the defendants.

Mortimer v. Tweedle.

A claim for an old debt was made at Blackpool County Court on November 6th by Wm. A. Mortimer, electrician, of Blackpool, against Robt. L. Tweedle. The claim was for £41—goods, £61, less cash paid on account, £20. Plaintiff was an electrical engineer. In 1913 defendant and his partner, Mr. Crawford, verbally instructed plaintiff to do some electrical work at South Shore. The contract specified that the work should be done under the supervision of an expert for Live Targets Co. The work was done in 1913, and from that time the debt had never been disputed. Mr. Woosman submitted for the defence that after all these years it was not right the action should be launched against Mr. Tweedle. The question was: For whom was the work done? The account had been debited to the Live Targets Co. Judgment was given for Mr. Mortimer for the amount claimed.

The Moving of the Waters.

At Devonshire Assizes, on Saturday, a curious point was raised in an action heard by Mr. Justice Darling, in which damages were sought to be obtained from Dulverton Rural District Council for pouring crude sewage into the Barle, destroying large numbers of trout in a fish hatchery. The defence of Mr. Emmanuel, K.C., was that the effluent was not harmful to fish life, and he cited the fact that between the sewage works and the hatchery stood the electric light works. Water from the Barle passed through a turbine at the works, and it was contended that in the process of being whirled around the water became aerated to an extent which made it innocuous. Evidence was given by Mr. J. T. Dairs, engineer to the Dulverton Electric Light Co., who computed that 36 million gallons of water were so dealt with daily. In reply, Mr. Foote, K.C., for the plaintiff, characterised the plea as absurd, but admitted that water tossed in a turbine underwent some slight purification if it were not clear before.

Prosecution of Mine Manager.

In Hamilton Sheriff Court, on November 5th, Sheriff Shennan gave his decision in the prosecution by the Crown of John McBride, Broomside, Manse Road, Motherwell, for alleged failure to carry out and to enforce to the best of his ability certain provisions of the Mines Act relating to the conduct of Dalzell & Broomside Colliery, of which he is the manager. Charges seven and eight related to the electrical apparatus, a certain portion of which in the blackband seam was alleged not to be so constructed and protected as to prevent danger. The manager, Sheriff Shennan said, appointed properly qualified men to attend to the electrical apparatus. Is it to be laid down that a manager must be through the mine examining all the bolts and the brushes of the electrical apparatus?

Dismissing this complaint, the Sheriff said it appeared to him to be so trivial that it savoured of persecution to prefer it against the manager. As regards other charges, his Lordship held there was no excuse for the manager failing to provide manholes, and he imposed a penalty of £3.

British Thomson-Houston Co., Ltd., v. Crown Light & Fittings Co.

Mr. Justice Peterson, in the Chancery Division on Tuesday, heard as a "short cause" this action on a motion for judgment.

Mr. Trevor Watson, appearing for the plaintiffs, said that the action came before the Court as a motion for judgment by consent. The plaintiffs sought an injunction to restrain an infringement of letters patent, and the defendants consented to judgment on terms contained in the minutes of the proposed order.

Mr. Kenneth Swann, for the defendants, consented, and his Lordship entered judgment as asked.

Subterranean and Submarine Antennæ.—A paper by Mr. A. H. Taylor published in the *Proceedings* of the Institute of Radio Engineers, August, 1919, deals mainly with the behaviour of short waves on underground and underwater wires. Following an historical survey he gives details of tests carried out since 1917 by Mr. H. H. Lyon for the U.S. Admiralty.

It has been shown that it is possible to receive signals very efficiently from stations emitting any wave length, using submerged or subterranean wires, provided that one or two stages of amplification be used. With underground antennæ consisting of stranded copper, rubber insulated cable buried one foot below the ground, reception may still be achieved when statics are such as to prevent reception on an aerial, and the buried antenna has directivity. Bare wires give greater strength of signal, and the tests indicate that the optimum length for the wires is about ¼ of a wave-length. The best results are obtained with the wires under water, in which case the signals are 20 times as strong as with wires embedded in dry sand. The optimum length of the wires is inversely proportional to the capacity per unit length of the wire, measured against the ground. Thus, it is preferable to lay the wires in wet soil, or water, as this gives the loudest signals, greater suppression of strays, and a fixed optimum length, due to the absence of variation of the capacity to earth, which would occur with earth of variable humidity. It is recommended that a pair of wires at right angles be used, in order to receive from any direction. Experiments with transmission from buried wires give good results over considerable distances with low power and sustained short waves. Signals were sent 36 miles with 0.8 ampere in the underground wires.—*Technical Review.*

BUSINESS NOTES.

Foreign Trade.—October Figures.—The following are the electrical and machinery figures given in the official returns of imports and exports for October :—

	October, 1919.	*Inc. or dec.*	10 *months*, 1919. *Inc. or dec.*
Imports.	£	£	£
Electrical goods, &c. ...	81,613	— 35,675	+ 114,380
Machinery	1,279,165	+ 604,172	+ 3,658,923
Exports.			
Electrical goods, &c. ...	597,874	+ 426,673	+ 2,694,688
Machinery	3,529,442	+2,137,845	+11,413,054

German Wire Lamp Prices.—According to a communication made by the Verkaufstelle fur Elektrische Gluhlampen, the prices of "electric wire lamps and glow lamps" have been increased from 30 per cent. to 75 per cent., as from October 25th. It may be assumed that this is the first result of the decision to merge the Auer company's Osram works into those of the A.E.G., which was reached at the recent meeting of the former company.

Birmingham Fair.—The Committee of Management of the British Industries Fair (Birmingham), 1920, have overcome their initial difficulty, and have now secured buildings which will provide them with 150,000 sq. ft. of space for the housing of the exhibits. The trouble in this centre has always been the lack of a building of suitable dimensions, and this has been more fully realised and emphasised as the number of exhibitors has grown, and the problem of accommodating all of them has led to constant expansion in the proposed utilisation of kiosks in open spaces and other means of offering the accommodation. The rapid and successful booking of space has compelled the Committee to make a drastic alteration in their original arrangements, and they have obtained the loan of suitable buildings which were erected during the war at the Castle Bromwich Aerodrome. The Air Ministry has consented to the buildings being used for the purpose, and there need be no further limitation of space. Exhibitors showing their products in two or more groups will be able to have the same under their eye without travelling to other locations, and the buyers who have more than one interest will not be called upon to move from one district to another. The Town Hall will be used as a reception bureau for all buyers visiting the Fair. Some 500 firms have already taken space.

Social Notes.—The Sterling Athletic Club, Dagenham, for the fourth successive Saturday were engaged in a Cup Tie, East Ham Albion being defeated in the Barking Charity Cup Competition by 7 goals to 1.

The demobilised men on the staff of the Stepney Borough Council electricity supply department were entertained to supper by their colleagues, on November 3rd, at Anderton's Hotel, Fleet Street, E.C. In the absence of the chairman of the Committee, Mr. W. C. P. Tapper, the electrical engineer and manager, presided. The toast of the evening, "Our Guests," was proposed by Mr. W. Young (resident engineer), who welcomed the "old boys" back. He said that out of 62 members of the staff who joined the Colours, no fewer than 11 had made the great sacrifice, while 13 had been wounded. The department had faithfully carried out their promise to reinstate every man who desired to return, 41 of whom had already done so, while only six had taken employment elsewhere. Four were still in H.M. Forces. 741 parcels had been sent out to the "boys" during the war. Mr. C. Taylor responded on behalf of the guests. Mr. Tapper proposed a silent toast "To the honour and memory of our unseen guests," whose names were inscribed on the Roll of Honour in the programme of the evening. Votes of thanks were passed to the Fund Committee, and to the chairman for presiding. A number of musical items were rendered during the evening.

The Bradford Tramways Ambulance and Nursing Divisions held their sixth annual concert in the St. George's Hall, Bradford, on November 5th.

A successful social evening was held by the West Midlands Branch of the Electricity Supply Commercial Association on Saturday evening last, at Rodway's Restaurant, Birmingham. More than 80 members and their friends were present. At the conclusion of progressive whist, light refreshments were served, and prizes were distributed by Mrs. Newbold, of Coventry, to those who had obtained the highest score. Part of the evening was given up to music. The concert was presided over by Mr. D. Mills, the chairman of the Branch, and items were contributed by Miss Skelton and Miss Woolley (Shropshire, Worcestershire, and Staffordshire E.P. Co.), Mr. Billingham (Walsall electricity department), Mrs. Hill, and Messrs. C. F. Mottram, E. B. Gregory, G. Ward, P. H. Hill, and C. H. Ford (Birmingham electric supply department). The general arrangements were carried out by Mr. S. H. Evans, secretary of the West Midlands Branch. It is proposed to hold meetings of a similar character at intervals during the coming winter months.

The Huddersfield tramway employés have formed a social and athletic club, of which Mr. C. H. Smith is the secretary.

The Huddersfield Tramway Men's Association Football Club played the Birmingham tramway men in the first round of the National Tramways Shield Competition, on November 5th. Result: Birmingham, 8 goals; Huddersfield, *nil*. After the match a dinner was served at the Plough Hotel, 60 guests and friends being present, and complimentary speeches were delivered by prominent officials from both towns.

The F.B.I. and Imperial Preference.—The Manchester correspondent of *The Times* states that the Manchester District of the Federation of British Industries has decided against the proposal for the amalgamation of the Federation with the British Empire Producers' Organisation. The Empire Producers' Organisation has, it is understood, made it a condition of amalgamation that the Federation of British Industries should give its adherence to the policy of Imperial Preference. The proposal came before a private general meeting of the members in the Manchester area on Tuesday, last week. It was plainly hinted that the cotton textile section of the Federation might secede bodily if the proposal for amalgamation with the British Empire Producers' Organisation is proceeded with. The question was to come before the Federation in London on Wednesday, this week.

Liquidations and Dissolutions.—Connolly Bros., Ltd., Blackley Vale Mills, Blackley.—The summary of the statement of affairs in this winding-up shows that, as regards creditors, the gross liabilities are £22,907, and these is estimated by the officers of the company to reach £17,907 (119 unsecured creditors). The total assets are estimated to produce £67,454, including £20,533 stock-in-trade, stores, &c.; £35,500 machinery, plant, trade fixtures, fittings, utensils and premises; and £11,286 for book debts. Deducting from £67,454, loans on debenture bonds secured on the assets of the company and liabilities of receiver, £50,011, there is an estimated balance of £17,443 to be received from the receiver to meet unsecured creditors subject to cost of liquidation, resulting in an estimated deficiency of assets to meet liabilities of £464, subject to cost of liquidation. As regards contributories, there were 1,805 ordinary shares of £5 allotted to vendors as fully paid = £9,025, and to directors and others 2,137 ordinary shares of £5 each = £10,685, plus the above deficiency of £464, making the total deficiency £20,174. This deficiency is summarised thus:—Losses and depreciation since July 31st, 1918: Bad debts, £679; depreciation of premises on sale by auction, £13,281; costs of sale and valuation, £1,000; loss on stock, £15,000. Other losses and expenses are £2,000 interest on certain debts at the date of Receiver's appointment, and £759 estimated loss on trading since July 31st, 1918. This makes £32,719, less excess of assets over capital and liabilities on July 31st, 1918, as per company's balance-sheet, £12,545 = £20,174. The winding-up order was made by the Court on July 1st, 1919, upon the petition of creditors. The business in its earlier years was prosperous, and made considerable profits for several years after the incorporation of the company in 1895, but they subsequently declined. Funds were raised by debentures from time to time. At the date of the winding up the debentures returned as outstanding were £25,121 principal and interest. The debentures are charged upon the whole of the assets. In February, 1911, a receiver and manager was appointed by the Court for the debenture-holders. The business has since been carried on at a considerable profit, and the Receiver has paid off 50 per cent. of the amount due upon the first debentures at the date of his appointment. With the approval of the Court, the business was sold by the Receiver on June 17th, 1919, and realised £35,500, in addition to the stock and stores taken over at a valuation of £20,533. The estimated balance to be ultimately paid over to the Receiver is returned at £17,445, but it is possible that a larger sum will result. The completion of the purchase has unavoidably been delayed. The £17,907 for unsecured creditors is in respect of goods, advertising, freight and carriage, cash advances, &c. A claim for excess profits duty (about £5,000) has been put forward, but this can only be maintained after the creditors have received 23s. in the £. The failure of the company is attributed by Mr. H. Connolly chiefly to severe trade competition at home and abroad.

The first meeting of creditors was to be held yesterday.

Evans & Goss, electric lighting, heating and power contractors, 94, Gloucester Road, Bishopston, Bristol.—Mr. C. H. Evans and F. C. Goss have dissolved partnership. Mr. F. C. Goss will attend to debts.

J. Jones & Co., electrical and mechanical engineers, 18, Canal Street, Nottingham.—Messrs. J. Jones and W. Mason have dissolved partnership. Mr. Jones will continue the business alone, and will attend to debts, &c.

A Cardiff Award.—The *Western Mail* states that the Court of Arbitration award is announced in the case of Messrs. J. B. Saunders & Co., electrical engineers, Cardiff, and the Electrical Trades Union. The question was whether the firm's telegraph staff, who are members of the E.T.U., should be classified as railway workers or as contractors' men, to whom the district card of the E.T.U. should apply. The men are telegraph linemen and wiremen, and assistants. The Court awards that the men are not to be classified as railway workers, but as contractors' men; and paid the district rates agreed upon for the different classes of employés in the electrical contracting industry, the award to take effect from the beginning of the first pay period following October 29th.

German Telephone Factory in Bohemia.—It is reported from Prague that the Telephone Works Co. (late J. Berliner), of Hanover, has sold its telephone factory at Olmütz to a company to be formed by the Prague Credit Bank.

Vickers, Ltd., and Brown, Boveri.—According to the Geneva correspondent of the *Daily Express*, Messrs. Vickers, of London, have come to an arrangement with the Swiss firm of Brown, Boveri & Co., of Zurich, under which Messrs. Vickers obtain exclusive rights to the patents of the Brown, Boveri Co., for Great Britain and the Colonies, while at the same time the two electrical firms will work together in Western Europe, France and Italy.

Removal of the Board of Trade to New Offices.—The President, Parliamentary Secretary, Permanent Secretaries, and the staffs of the following departments of the B. of T. are now installed in their new offices in Great George Street (Provisional Telephone Numbers, Victoria 9800 and 9160):—Commercial Relations and Treaties; Industries and Manufactures; Power Transport, and Economic; Marine; Secretariat of the Board of Trade Council, *Board of Trade Journal*, and establishment. The Public Utilities and Harbour Department, Legal Department, and Library, still housed at 7, Whitehall Gardens, will be removed to the new offices in the course of the next week or so. The headquarters of the Statistical Department, the Controller of Trading Accounts, the Capital Issue Committee, and the War Insurance Accounts Branch will remain at Gwydyr House, Whitehall, S.W. 1; the Finance Department will remain at Whitehall Gardens, S.W. 1; and the Bankruptcy Department will remain in Horse Guards Avenue, S.W. 1 (Telephone Number, Victoria 3840).

Barton Power Station.—From an "Official Notice" appearing in this issue, it will be observed that the Manchester Corporation Electricity Committee is now inviting tenders for four 25,000-kw. turbo-alternators, four boilers, coal conveying, and other plant required for its Barton scheme.

Catalogues and Lists.—The London Electric Stores, Fulwood House, High Holborn, W.C. 1.—Illustrated price list (1 S.G./1) of ironclad switch and fuse-gear.

Messrs. J. H. Tucker & Co., Ltd., King's Road, Hay Mills, Birmingham.—Illustrated folder, F3, giving prices of one and two-way quick-make and quick-break switches, also folder 1919.

The Stanton Iron Works Co., Ltd., near Nottingham.—November stock list of cast-iron pipes.

The Hart Manufacturing Co., 76 and 77, Rochester Row, Westminster, London, S.W.—Illustrated price list of "Diamond H" remote control switches. Also illustrated price list of "Diamond H" switches and electric lighting specialities.

Messrs. Siemens Brothers & Co., Ltd., Palace Place Mansions, Kensington Court, London, W. 8.—Illustrated catalogue No. 537, dealing with dry cells and batteries.

The British Thomson-Houston Co., Ltd., Mazda House, 77, Upper Thames Street, E.C. 4.—Illustrated folder, giving prices and description of Mazda motor-car lamp bulbs.

Messrs. Crossley Bros., Ltd., Manchester.—Twenty-four-page pamphlet, entitled "Dearer Coal and Cheaper Power." Illustrations appear of their waste-fuel suction gas plant, suction gas engines, heavy oil engines, and large multi-cylinder gas engines for electricity works.

The British Rawhide Belting Co., Ltd., Hythe Road, Willesden, N.W. 10—New circular giving prices, &c., of "Chicago Rawhide" belting—oak tanned leather and Balata. Also leaflets relating to their Rawhide pinions, packing, mallets and hide-faced hammers.

Engineering Wages Award.—The award was issued, last week, by the Court of Arbitration in respect of the claims submitted by the Engineering and Foundry Trades for an advance of 15s. a week to men 18 years of age and over, and 7s. 6d. a-week to boys, youths, and apprentices under that age, with equivalent advances to piece workers. After carefully weighing all the various considerations raised by the applications, the Court award, in full satisfaction of the claims submitted, an advance of 5s. a full ordinary week to male workers of 18 years of age and over. The first payment of the advance to be made on the pay day immediately following December 1st, 1919, in respect of the pay period for which payment is made on that day. The amount awarded is to be taken into account in the calculation of payment for overtime and night duty and for work on Sundays and holidays, and will form part of the total earnings of time and piece workers upon wnich the bonuses of 12½ per cent. and 7½ per cent. respectively are to be calculated, but it is not otherwise to apply to or affect present time rates, premium bonus rates, or piece-work prices, and is not to be taken into account as part of the time rates for the purpose of fixing new piece-work prices or bonus rates.

Catalogues Wanted for S. Africa.—H.M. Senior Trade Commissioner in South Africa (Mr. W. G. Wickham) desires to receive copies of British post-war catalogues for indexing and filing in his commercial reading room for the use of local importing firms. They should be sent direct to him at P.O. Box 839, Johannesburg, to which place he has recently transferred his headquarters.

Reconstruction in Poland.—We have received from the Polish Commercial and Financial Agency, of 88, Kingsway, W.C. 2, a copy of the first number (October, 1919, one shilling) of the *Polish Economic Bulletin*. It contains a great deal of information regarding industrial reconstruction matters, Polish economic wealth, opportunities for British trade, banking, currency, tariff, patent and other subjects, &c., which, in such a collected form, should be useful to British traders who are interested in business openings in the parts of Europe which it is important to restore to peace-time activities and prosperity as speedily as possible. Among the requirements of the market the following are mentioned:—Electric motors, pneumatic and electric hammers for boring purposes, all kinds of electrical material both for mine and surface service, electric cables, steam boilers, machine tools, mechanical tools, &c. The German Commission in Warsaw for the Requisition of Machinery took 1,650 electric motors and dynamos, 65 portable steam engines, and 157 tons of electric cables, and these require immediate replacement.

Book Notices.—The Jubilee number of *Nature*, which appeared on November 6th, was fully up to the expectations which we had formed. In a brief article entitled "Valedictory Memories," by Sir Norman Lockyer, K.C.B., F.R.S., the veteran scientist (he is now 83 years of age) gives an interesting account of the circumstances under which he was led to establish the journal in 1869, with the support of practically all the leading workers in science of the time; he most appropriately forms the subject of a biographical article and portrait ("Scientific Worthies," No. XLI), which points out that he is distinguished not only by his eminent public work and his gift for organisation, but also as one of the greatest men of science of our time, having been one of the pioneers of astrophysics and a born investigator. The author of the article, M. H. Deslandres, describes Sir Norman as "one of the greatest astronomers of all time." But *Nature* never confined its attention to astronomy; from the first it took a broad view, and aimed "to place before the general public the grand results of scientific work and scientific discovery, and to urge the claims of science to a more general recognition in education and in daily life," besides aiding scientific men themselves with early information and a medium for the discussion of scientific questions. How admirably those aims have been, and are being, fulfilled its world-wide readers know. Amongst the many eminent men who have written special articles for the Jubilee issue are some who were contributors to the earliest issues of the journal. Covering as they do the progress in all the leading branches of science, these articles mark an epoch and form a valuable record of the stage at which we have arrived. The progress of electrical invention is the subject of an article by Dr. J. A. Fleming, who has ably handled in a small space the mass of material offering itself; and Dr. W. C. Unwin deals with the developments of mechanical science. Sir R. A. Gregory has chosen for his subject "The Promotion of Research," a matter with which no one is more at home. There are in all some 40 special articles, and an interesting item is a list of the British scientific societies founded during the past 50 years, nearly 70 in number.

A new journal, to be called "Discovery" (with the consent of Sir R. A. Gregory and his publishers), is to be issued early next year, under the ægis of the Royal Society, to give in popular form the most recent results of research in all branches of knowledge. Captain A. S. Russell, M.C., D.Sc., will be the editor, and Mr. John Murray the publisher.

Technical Paper of the Bureau of Standards No. 18, "Electrolysis in Concrete," contains the results of a series of long-time tests, which show that with the reinforcing iron as anode at very low current densities, rusting of the iron and cracking of the concrete eventually occur. In the specimens under test, damage became apparent in from four to eight years. The cathode effects noted in former tests had not progressed much beyond the point reached at the end of the first two or three years. Washington: Government Printing Office. Price 35 cents.

Technical Paper No. 127 of the Bureau of Standards. "Leakage Resistance of Street Railway Roadbeds and its Relation to Electrolysis of Underground Structures."—Several methods of making electrical resistance measurements on street railway roadbeds and on experimental roadbeds are described, and the results of such measurements are given in tabular and graphical form. Certain conclusions are reached regarding the best type of roadbeds and the best methods of treating ties where the reduction of stray currents is important. Washington: Government Printing Office. Price 10 cents.

Scientific Paper of the Bureau of Standards No. 341, "Airplane Antenna Constants," contains general information regarding the effective capacity, effective resistance, true capacity, true inductance, and wave length, as well as the transmitting directional effect, of various types of aeroplane antennas. Washington: Government Printing Office. Price 5 cents.

"Some Electric Transmission Considerations." Notes prepared by Mr. S. L. Pearce, C.B.E. Reprint from the *Journal* of the Incorporated Municipal Electrical Association, with the discussion and the author's reply.—The reprint contains the complete set of curves upon which Mr. Pearce based the comparative curves reproduced in the Electrical Review at the time of the I.M.E.A. Convention.

We welcome the 1920 edition of *Punch Almanack* (1s. net).—The glowing face of our merry friend on the front cover, and the abundance of mirthful possibilities within, remind one that the first of Merry Christmases since the signing of Peace will soon be here. The inset gives a number of humorous topical illustrations entitled "The Age of Production," and there is a full-page sketch, "Demobilised."

"The Costing Problem." By E. T. Elbourne. Pp. vii + 138. London: The Library Press, Ltd. Price 4s. 6d. net.

"Efficient Boiler Management." By C. F. Wade. Pp. xiv + 266; 143 figs. and 7 tables. London: Longmans, Green & Co. Price 12s 6d. net.

New Belgian Company.—La Société les Cableries Belges pour la Fabrication des Cables et Fils Electriques et l'Industrie du Caoutchouc is the name of a new company which has lately been formed in Brussels (33, Rue de Luxembourg), with a capital of £80,000.

Registration of U.S.A. Addresses.—The premises of the American Central Bureau for Registered Addresses are situated at 31, Broadway, New York, according to a circular recently issued. It appears now that only "local" addresses will be recorded, the correspondents on this side having to register with the various telegraphic undertakings free or the General Post Office at the usual charge per annum.

American Electrical Conditions.—The printers' strike still continues in New York. The fourth number of the *Electrical World Bulletin* (October 24th, 1919), which is just to hand, states that the Chicago electrical show made Chicago a busy centre at the time of publication. Engineers from Japan, England, and all sections of the States, attended the thirteenth annual convention of the Illuminating Engineering Society, on October 20th to 23rd. Other electrical associations were also holding conventions there at the same time. The *Bulletin* reports that shortages in wiring material and heating devices are becoming more acute. Deliveries are becoming longer in almost every line. Stocks of ½-in. conduit, pull chain sockets, flexible metallic conductor, and No. 14 rubber-covered wire are particularly low and hard to fill. Prices still show an upward trend with advances noted on safety switches, outlet boxes, N.R.C. fuses, and vacuum cleaners. No deliveries on current orders of heating devices can be expected as a rule prior to the first of the year. One New England jobbing house is now filling orders on washing machines at the rate of $1,000,000 annually.

Trade Announcements.—The Electrical Supplies Co. announce that, owing to the rapid growth of their fittings and heating departments, they have arranged with Mr. A. L. Williams to take over the managership of these two departments entirely. They have also appointed Mr. Leonard Thornton as general manager of the company.

Messrs. W. J. Furse & Co., Ltd., electrical engineers, have removed to new premises at Leyland Street, Derby.

Trade with Bulgaria.—A correspondent of the *Manchester Daily Dispatch* says that a group of business men in this country is making a strenuous attempt to open up trade with Bulgaria, with whom officially Britain is still at war. It is stated that permission has been granted to Messrs. Nicholas Dishkoff and Alexander Mehandjisky to visit England with the object of offering various goods for sale, and for buying agricultural machinery and implements, medical stuffs, and railway, and electrical materials.

Controlled Establishments (Revocation of Control).—The Ministry of Munitions has revoked all orders made under Section 4 of the Munitions of War Act, 1915, and of Section 1 of the Munitions of War (Amendment) Act, 1916. The establishments specified in the said orders will no longer be controlled establishments. The Admiralty has also revoked the orders relating to the Control of Docks.

Employés in Railway Shops.—By an award of a Court of Arbitration men employed in railway shops are to receive an advance of 5s. a week. They had applied for 15s.—*Financial Times.*

A 10,000-Mile Test.—Messrs. C. A. Vandervell and Co., Ltd., have received official intimation that, on completion of the 10,000-mile Benzole test, which was carried out on a 16/20-h.p. "Sunbeam" car, no adjustments of any kind had to be effected on the C.A.V. electric lighting and starting equipment; no trouble whatever was experienced during the entire run.

A Nationalisation Vote at Pretoria.—By 44 votes to 40, the conference of employers and employés at Pretoria has adopted a resolution in favour of the nationalisation of industries. The minority consisted of the employers.—*The Times.*

French Electrical Company.—La Compagnie Générale de Telephones et Electricité is the name of a new company which has lately been formed in Paris, with a capital of £40,000.

LIGHTING AND POWER NOTES.

Bath.—Loan.—Application is being made for a loan of £30,405 for the electricity works.

At the inquiry into the application on behalf of the M. of H., it was stated that the proposal was to install a 1,500-kw. turbo-generator, which would result in a total saving of £6,790 per annum. It was also desirable to provide £5,000 for mains, of which the present application took no account.

Bradford.—Coal Fire.—For over three weeks stacks of coal, amounting to some 2,500 tons, have been burning at the Corporation electricity works. The coal is stored in two separate stacks, and the cause of the fire was spontaneous combustion. The cost of fighting the fire is stated to be more than the coal itself is worth.

Canterbury.—Loan.—The T.C. has applied for a loan of £20,000 for a 1,000-kw. turbo set and transformers. It is estimated that the new plant will effect a saving of over £1,000 a year in coal.

Cavan.—E.L. Scheme.—Lord Farnham has intimated to the promotors of the Cavan E.L. and P. Co. that he is willing to grant a free site for works close to the Town Hall. About £3,065 has been subscribed, and when £3,500 has been reached, two gentlemen, it is announced, are ready to bring the capital up to £4,000.

Chesterfield.—Price Increase.—The T.C. has increased the price of electricity for lighting and power to 75 per cent. over pre-war rates, and a similar advance has been made in the price of energy supplied to the tramways.

Continental.—France.—On Wednesday evening last week Paris was in darkness for a short time, and the Metropolitan electric trains were forced to travel at very low speeds. On the 6th inst. the West Paris Electricity Co. announced a considerable curtailment of its supply. The East Paris Co. is to generate only on alternate days, "with short stops to allow the voltage to increase." One company has only one out of three turbines working with the result that in order to maintain public and private lighting services the power supply to factories has had to be cut off. The coal shortage has become grave; a rationing scheme has been started at le Havre, and the Paris Prefect of Police has ordered cafés and restaurants to close one hour earlier than usual in order to economise light. The electricians are stated to be in favour of taking the opportunity of declaring a strike unless their demands are met.

From the 10th all factories in the Seine Department (that of Paris) were to be allowed only sufficient electricity to work alternate day and night shifts. This arrangement has been made as a result of a conference between manufacturers and the E.S. companies.

Czechoslovakia.—The Parliament of the newly-created State of Czechoslovakia has just voted a law for the utilisation of the hydro-electric resources of that country. Estimates have fixed these at a total of 800,000 h.p., and their utilisation would involve a saving of nearly 600,000 trucks of coal per year. The installations will call for an outlay of two milliard crowns for the hydraulic plant, 500,000,000 crowns for the central stations, and one milliard for the distribution of the energy. The State will take a financial share in this electrification. According to the law voted, the setting aside of a sum of 75,000,000 crowns per year is to be a feature in each year's budget from 1919 to 1923. A portion of this provision—50,000,000—is allocated to the building of hydro-electric stations; the rest is to form a fund to enable the State to help undertakings generating and distributing electricity. The State, the country, the departments, and the communes will take up, alone or joined with existing concerns, 60 per cent. of the capital, so that they will have a voice in the management of the undertakings. It is intended to build nine large installations in the Czechoslovak territory—four in Bohemia, three in Moravia, one in Silesia, and two in Slovakia.

Darlington.—Year's Working.—The net profit on the electricity undertaking for the year ended March 31st, 1919, was £3,000, whilst the output was only 1 per cent. less than the previous year. The total revenue was £43,815, an increase of about 7 per cent. on the previous year. The total number of units generated was 10,350,294, and the total cost per unit, excluding capital charges, was 0·62d. The coal cost was 0·34d. per unit generated.

Dartford.—Abolition of Discount.—The U.D.C. has decided, for the time being, to withdraw the discount allowed to ordinary consumers of electricity, amounting in the aggregate to approximately £500 a year, as from January 1st.

Dublin.—Loan Sanction.—The B. of T. has sanctioned the loan of £64,976 for the extension scheme.

Gillingham.—Price Increase.—The T.C. has cancelled as from November 15th the special outside lighting rate of 3½d. per unit, plus 50 per cent., and all energy for such lighting is to be charged for at the ordinary lighting rate.

Halifax.—Loan.—The E.C. is to apply to the M. of H. for sanction to borrow £170,000 for a 10,000-kw. turbo-generator and auxiliaries.

Hastings.—Year's Working.—The annual accounts show an income of £20,915, being a decrease of £26. The expenditure amounted to £17,232, an increase of £2,828. Interest and sinking fund charges totalled £10,458. The net result was a deficit of £6,800, which was met out of the general district rate account. Total units generated were 1,156,953, while the total units sold were 916,563.

Kingston-upon-Thames.—Boiler Explosion.—The report published by the B. of T. on a preliminary inquiry into a boiler explosion which occurred on November 21st last at the Corporation electricity works, states that the boiler was of the usual Babcock & Wilcox water-tube land type, having 108 tubes. It had the usual mountings, the safety valves being loaded to 150 lb. per sq. in. The report concludes with the following observation:—"The tube failed in the ordinary course of working, apparently owing to deterioration through long usage, it being one of the original tubes fitted in the boiler some 22 years ago. It would probably be very difficult to have detected the defective condition of this tube before it burst, but in view of what has now happened, the condition of the material of the other tubes of the same age should be carefully ascertained, for which purpose it may be necessary to withdraw a proportion of them and subject the material to bending tests."

Lancaster.—District Board.—Last week a conference of local authorities and large consumers of electricity, was held for the purpose of considering the formation of a District Electricity Board under the Electricity (Supply) Bill now before Parliament. The Mayor of Lancaster (Councillor Briggs, J.P.) presided, and representatives were present of the Corporations of Lancaster, Morecambe, and Kendal, the Urban Councils of Carnforth, and Heysham, and the Rural District Councils of Lancaster, Limsdale, Garstang, and South Westmorland, as well as of the Midland, Furness, and L. & N.-W. Railways, and other large consumers.

It was suggested that local authorities and power consumers and all interested parties should get together and consider what was the best scheme for their particular district—what the requirements were, and what facilities existed to meet the demand—to be presented to the Commissioners. Lancaster appeared to be the normal centre of the district, which it was suggested should extend from Kendal on the north to Garstang on the south, taking in all the intervening country. For the adjoining area in the north a scheme was already being considered by the Barrow and South Westmorland district, whilst Preston and Fleetwood control led the adjoining area in the south.

In the course of the discussion it was mentioned that a large and up-to-date plant existed at the National Projectile Works, Lancaster, and it was decided that a Provisional Committee be appointed to conduct investigations as to the demand for electricity and the facilities of supply in the district, and to formulate a scheme to be submitted to a future meeting, the Committee to comprise five representatives of the railways and large consumers; representatives of the Corporations of Lancaster, Morecambe, and Kendal, and of the urban and rural authorities in the district. Major G. C. Milnes, electrical engineer at Lancaster, was appointed secretary to the Committee.

Leeds.—Prices.—We regret that an error under this heading occurred in our issue of October 31st. The minimum charges for lighting are as follows:—Quarters ending June 30th and September 30th, 2s. 6d. plus 80 per cent. Quarters ending March 31st and December 31st, 5s. plus 80 per cent.

Hours of Work.—Mr. J. B. Hamilton, the commercial manager for the City of Leeds, has been asked to formulate a scheme for the establishing of a 48-hours' week for the Corporation employees.

London.—L.C.C.—Alterations, which will cost about £3,000, are to be made to the coal bunkers at the Greenwich power station. This figure includes the completion of coal shoots.

Hackney.—Owing to plant shortage, the E.C. appeals to consumers for economy in lighting between 4 p.m. and 6 p.m. on Mondays, Tuesdays, Wednesdays and Fridays, and during dark days.

Maidstone.—Loan.—The T.C. has applied for a loan of £17,500 for the purchase of a turbine and auxiliaries.

Pewsey.—E.L. Scheme.—A Committee of Ratepayers has been appointed to prepare plans, &c., for an E.L. installation for the town.

Portsmouth.—Year's Working.—The annual accounts for the year ended March 31st, 1919, show a total expenditure of £52,951, compared to £42,747, and a total income of £60,103, against £56,797 last year. The balance of £7,152 was carried over to the net revenue account. The total units generated were 4,125,780, and total units sold 168,930, as follows:—Public lighting, 94,300; by contract, £4,200; private consumers, 2,999,204. The total maximum supply demanded was 2,200 kw.

Sidmouth.—Price Increase.—The B. of T. is to be asked to sanction the increase of the maximum price for electricity to 1s. 6d. per unit.

South Wales.—Colliery Electrification.—The Powell Duffryn Co. is reported to have commenced sinking operations at a new colliery it is opening at Deri, 2 miles from Bargoed, South Wales; the shaft will be 500 yards deep. This new colliery will be arranged on modern lines, the whole of the machinery being worked by electricity. It will employ about 2,000 men, and raise about 3,000 tons of coal daily. To supply electrical energy for this and other local collieries the company is building a power station at Bargoed, which will be the biggest private electrical enterprise in the kingdom. Already the Britannia Colliery at Bargoed, belonging to the same company, is worked entirely by electricity. There is not a horse in the pit and not an ounce of rubbish is raised to the surface, and the new colliery will be on the same lines.

St. Annes—Loan.—Application has been made to the M. of H. for sanction to borrow £3,000.

West Bromwich.—Price Increase.—The price of electricity for lighting is to be increased by 1d. per unit.

Wigan.—Extensions.—The Corporation is carrying out extensions at the electricity works with a view to largely increasing present output.

Loan.—The T.C. has applied for a loan of £3,000 for the purchase of electric motors.

TRAMWAY AND RAILWAY NOTES.

Brazil.—Railway Electrification.—It is reported that an Anglo-Italian syndicate has offered to the Brazilian Government to undertake the electrification of the Central Railway, and a French syndicate has submitted to the Government a competitive similar proposition.

Colne.—Breakdown.—Owing to delay, caused by the ironfounders' strike, in repairs to the large turbine at the electricity works, which broke down a few weeks ago, it has become essential to withdraw special cars from the tramway service.

Continental.—Germany.—As was recently reported, the lack of funds has caused a suspension of the constructional work in connection with the projected underground electric railway which is to connect the north with the south of Berlin, namely, that between Gesundbrunnen and Neukolln. It is assumed, however, that the financial difficulty will be overcome, and that the municipal authorities concerned will have to render assistance if necessary. On the other hand, work is proceeding on the railway section between the Hallesche Tor and the Weddingplatz, which passes through the whole of the Friedrich Strasse, but operations are at a standstill on the western connecting railway between Nollendorfplatz and the Triangle (Geleisdreieck). The scarcity of cement, coal, and iron and steel, in Berlin, together with the high wages prevailing, play an important part in hampering progress. The most comprehensive scheme for the extension of the railways in Berlin, is that of Herr Giese, which proposes the construction of lines which, including those already building or at work, would make a total of 108 miles, of which about 62 miles would be underground. The expenditure on the new lines would amount to £46,350,000 on the pre-war basis of calculation.

A tramway strike is in progress at Aix-la-Chapelle, but the Belgian Military Commandant has requisitioned the services of some of the tramway employés to transport the rations of the forces of occupation.

Cork.—Wages.—The Conciliation Board has effected a settlement between the Electric Tramway Co. and its employés, by which 150 get an increase of 5s. in the weekly wage, while the working hours of conductors and drivers have been reduced from 8 hours 40 minutes per day to 8 hours 15 minutes, and from 8 to 7 hours on Sundays, with a day off in every 10 instead of every 12 days. Firemen's hours are reduced from 52 to 51, and the hours of other employés to 48½.

Dewsbury.—Time Extension.—The Minister of Transport has extended the time of the Dewsbury Corporation Act, 1915, for the completion of the tramways for one year from July, 1920.

Glasgow.—Accident.—By the overturning of a tramcar after a collision with a traction engine on Monday, seven persons were injured.

London.—Traffic Committee.—The Advisory Committee on London Traffic, appointed by the Minister of Transport, was completed recently, and will hold its first meeting on Monday. The members are:—Mr. Kennedy Jones (chairman); Sir H. P. Maybury and Sir C. Bartolmé (Ministry of Transport); Mr. Hume (L.C.C.); Mr. Underwood (City Corporation); Mr. Francis Dent (Essex County Council), and Mr. Will Thorne, M.P. (Labour).

Sir Philip Sassoon, M.P., has been appointed Parliamentary Private Secretary, unpaid, to the Minister of Transport.

Tube Traffic.—The number of passengers using Charing Cross Station daily, which is served by the District, Bakerloo, and Hampstead Railways, is 222,000; a total of 2,920 trains pass through the station daily.

Accidents.—In Jamaica Road, Bermondsey, a fire on a tramcar had to be put out by the Brigade.

On Tuesday evening, an L.U.T. tramcar was derailed in the High Road, Chiswick, and delayed traffic for some time. Last week a car was derailed in the High Street, Brentford, and nearly overturned. Both these derailments occurred at spots where the track is being relaid.

On Tuesday morning, a District electric train pulled up at Blackfriars station, and for 20 minutes refused to start, delaying traffic.

Mansfield Woodhouse.—Electric Vehicle.—The Health Committee is to apply to the M.H. for sanction to a loan for the purchase of a 3½-ton electric vehicle for scavenging, together with the necessary charging plant, at a cost of £1,380.

Middlesbrough.—Railless Traction.—On Saturday last a railless traction system was inaugurated, which links up Middlesbrough, South Bank, Normanby, and Grangetown. The system is supplied with D.C. at 550 volts pressure from the Cleveland Steel Works at South Bank.

Shanghai.—Railless Electric Traction.—In addition to about 16·5 miles of electric tramways, the Shanghai Electric Construction Co., Ltd., has operated since 1915 a railless trolley-omnibus service in Shanghai, over a route approximately a mile in length. During last year 5·75 million passengers were carried by the seven vehicles which maintain the service, and owing to the lack of adequate width in many of the busy thoroughfares of the city not yet provided with electric traction, the Municipal Council has been authorised to negotiate with the company with regard to extension of the railless system. It is understood that in addition

to the railless passenger vehicles, it is also proposed to use similar vehicles for the transport of goods. To meet the increasing traffic requirements, a further seven railless cars of a new type are being built. From a report recently quoted in the *Indian and Eastern Engineer*, it appears that the average tire mileage obtained from the seven cars in use up to the end of 1918 has been :—Front tires, 23,796 ; and rear tires, 24,960 miles.

Southport.—Suspension of Service.—In view of the present working expenses, the T.C. is to suspend the inner circle of tramways.

Sunderland.—New Line.—The scheme for a new loop line along John Street has had to be abandoned because of opposition by the frontagers, and the Tramways Committee is now considering what alternative can be adopted.

Wigan.—Omnibus Service.—The Tramway Committee is now introducing motor omnibuses for the development of various routes.

TELEGRAPH AND TELEPHONE NOTES.

Australia.—The Commonwealth Parliament has passed a Bill giving it the same rights of control over wireless telephony as it had over wireless telegraphy. In presenting the Bill the Postmaster-General said that the Naval Board was considering the whole problem, and later on the Government would be able to indicate the Board's decision.

Dearer Press Telegrams.—It is announced by the Postmaster-General that from January 1st next the new rates for inland Press telegrams, which were sanctioned in 1916 and postponed until conditions became more normal, will be put into force. The present charges are 1s. for every 75 words between 9 a.m. and 6 p.m., and 1s. for every 100 words between 6 p.m. and 9 a.m., with 2d. extra per 75 or 100 words for each additional address. The new rates reduce the number of words of a day telegram to 60 and of a night telegram to 80, and increase the additional address charges to 3d. in either case.

Mr. Illingworth (Postmaster-General), in reply to a series of questions, stated that he had agreed to lease certain telegraph wires to the Press Association for the transmission of news on the same terms as applied to wires leased to newspapers. The Press Association would supply and work the apparatus. There would be no competition with the Post Office, which would be relieved of a certain amount of congestion. He had no control over the rates of pay given by the Press Association to operators.

Italy.—Telephonic communication between Italy and France has been restored.

Sweden.—Trials between a wireless station in Scotland and Karlsborg, Central Sweden, have given satisfactory results, and daily traffic between this country and Sweden will be commenced, but will only be used when the ordinary cables are defective.

Telephone and Telegraph Statistics.—With the results for September, 1919, ends the period of four years during which a fee of 3d. for a telephone call-office call has been in force in the London area. The actual figures compared with the year ended September, 1915, are :—

	Revenue.	No of calls.
1915-16 ...	3·07 per cent. increase	31·28 per cent. decrease
1916-17 ...	7·13 " "	28·57 " "
1917-18 ...	12·43 " "	25·04 " "
1918-19 ...	51·93 " "	1·28 " increase

In the 12 months ended March, 1914, 4,287,127 telegrams were forwarded abroad through the London Central Office alone, while 3,443,865 telegrams were received. During the same period the Liverpool Office, including the Cotton Exchange, dealt with 641,033 telegrams, of which considerably more than half were in the outward direction. In addition to this total of nearly 8¾ millions of telegrams, nearly 4 million words were dealt with in the shape of Press matter signalled over leased wires between this country, France and Germany. During the war the output was reduced to the extent of more than 50 per cent., but since the Armistice it has steadily been approaching pre-war figures.—*T. & T. Journal.*

The Radio Corporation of America.—A statement circulated by the *Wireless Press* relative to the Marconi Wireless Telegraph Co., of America, explains the relation of the parent British and American companies, and points out that the latter found itself greatly embarrassed in carrying out its plans consequent on the strong objection of U.S. Government officials to the stock interest held therein by the British company. This interest has, therefore, been eliminated by the formation of the Radio Corporation of America, which has entered into agreement with the General Electric Co. concerning present and future patent rights, the manufacture of patented apparatus, &c. Steps have also been taken so that the actual control of the Corporation shall at all times be in the hands of American citizens or corporations. The scheme does not involve the sale of the whole assets and property of the American company as an entirety, but does radically change the scope of its operations, and transfers the conduct of wireless communication and the sale of wireless devices to the new company. The financial details were briefly summarised on p. 567 of our October 31st issue.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Aberdeen.—November 27th. Great North of Scotland Railway Co. Six or 12 months' supply of telegraph material. Stores Superintendent, 80, Guild Street, Aberdeen.

Australia.—Sydney.—December 19th. Metropolitan Board of Water Supply & Sewerage. Centrifugal pumps, electric motors, &c., for the low-level pumping station, Marrickville. Offices of the Board, 341, Pitt Street, Sydney.*

City Council. January 5th, 1920. Electric Lighting Department. Outdoor H.T. switchgear (specification 566); air-brake switches (specification 565). Electric Lighting Department, Town Hall. —*Tenders.*

January 19th, 1920. Sub-station equipment (except power transformers). Contract No. 558.*

Melbourne.—P.M.G.'s Department. January 20th, 1920. Automatic telephone switchboard at Collingwood. Schedule 1,583. (September 19th.)

December 3rd. Victorian Railways. Portable electric welding set and accessories. Secretary for Railways, Spencer Street, Melbourne.*

P.M.G.'s Department, Melbourne. November 25th. Switchboard cable and switchboard parts (schedule 1,585).*

Bradford.—November 15th. Tramways Department. General stores. Mr. R. H. Wilkinson, Tramways General Manager, 7, Hall Ings.

Croydon.—November 17th. B.C. Erection and maintenance of electric motor and pump, and connections for sewage disposal works. (October 31st.)

Dublin.—November 26th. Electricity Supply Committee. 20,000 arc-lamp carbons. (See this issue.)

Dundalk.—November 19th. U.D.C. Electricity Department. 400 tons of light American fuel-oil, suitable for Diesel engines. (October 31st.)

Dundee.—November 20th. Electricity Department. Steelwork at the Carolina Port generating station. Mr. H. Richardson, General Manager and Engineer.

Enniskillen.—December 1st. Sligo Leitrim & Northern Counties Railway Co. 12 months' supply of electric telegraph material. The Secretary, Enniskillen.

London.—L.C.C. The Highways Committee recommends that tenders be invited for alterations to the coal bunkers and completion of the coal shoots at the Greenwich power station.

December 9th. Overhead electrical equipment, low-tension cable, and laying stoneware ducts, &c., in connection with the construction of the Lee and Eltham tramway. (See this issue.)

Manchester.—November 18th. Tramways Committee. Supply of block tin. Mr. J. M. McElroy, General Manager.

December 1st. Rivers Department. Supply, &c., at Davyhulme sewage works, Urmston, of three 30-H.P., three-phase, induction motors, &c. Secretary of Rivers Department, Town Hall.

December 24th. Electricity Committee. Specification B1. : two 25,000-KW. and two 1,000-KW., three-phase turbo-alternators, with condensing plant, comprising : main turbines, main alternators, main condensers, air and water extraction pumps and pipework, house-service turbines, house-service alternators. Specification B2. : four 100,000-lb. water-tube boilers, 375 lb. working pressure, comprising : water-tube boilers, complete, steel economisers, air heaters, induced and forced-draught plant and chimneys, flues, coal chutes and ash hoppers, pipework and valves. Specification B3. : coal and coke handling and conveying plant, and wagon tippers, comprising : coal and coke conveyors, capacity 100 tons per hour, wagon tippers. (See this issue.)

Plymouth.—December 5th. Corporation. Two water-tube boilers. (See this issue.)

New Malden (Surrey).—November 25th. The Maldens and Coombe U.D.C. Two 15-B.H.P. electric motors, and two 4-inch centrifugal pumps, at Kingston Vale pumping station. (See this issue.)

Sowerby Bridge.—November 24th. U.D.C. Supply of a 20-B.H.P. electric motor at the sewage disposal works, Milner Royd. Mr. James Eastwood, Engineer and Surveyor, Council Offices.

*A copy can be seen at the Inquiry Office of the Department of Overseas Trade (Development and Intelligence), London.

South Africa.—Johannesburg.—December 1st. Municipal Council. One 500-kw. converter, or alternatively, one 750-kw. converter, for one of the suburban tramway sub-stations. Specification No. 114.*

January 8th. Municipal Council. Copper wire, cable insulators and steel poles (Contract No. 548). Specification from Town Clerk, Municipal Offices, Johannesburg.—*B. of T. Journal.*

Spain.—Madrid.—January 2nd, 1920. Concession for an electric railway from Madrid to Valencia. Points which will be considered are: (1) Reduced fares; (2) reduction of maximum interest guaranteed by the State; (3) shortening of length of the concession. Apply Direccion General das Obras Publicas, Madrid.

Tynemouth.—December 1st. Electricity Department. 5,500 yd., three-core, paper-insulated, lead-covered, 6,600-volt cable; 5,500 yd., four-pair, paper-insulated, lead-covered, telephone cable; 5,500 yd., three-core, conductor cable. (October 31st.)

Walthamstow.—November 26th. U.D.C. Electricity Department. Cast-iron circulating water pipes, E.H.T. and L.T. cable, engine room crane. (October 31st.)

CLOSED.

Australia.—Sydney.—Electric Lighting Committee. Recommended :—

400 5-amp. consumers' meters.—Warburton, Franki & Co; 250 5-amp. meters.—Edison & Swan; 100 3-amp.; 550 5-amp.; 220 10-amp.—Aust. General Electric Co. Total £3,138.

Melbourne City Council. Accepted :—

340 A.C. meters, 230 v.; 70 do., 400 v., £820.—Aust. General Electric Co.
400 do., 230 v., £1,207.—W. G. Watson & Co.
50 D.C. meters, 230 v., £262.—Aust. General Electric Co., Ltd.
Insulated copper cables, £291.—W. T. Henley's Telegraph Co., Ltd.

Prahran & Malvern Tramway Trust, Victoria :—

Six four-motor bogie tramcars, £6,921.—J. Moore & Son (Melbourne).
—*Tenders.*

Belfast.—Electricity Committee :—

Two H.T. feeder panels, £1,912.—Metropolitan-Vickers Electrical Co., Ltd.

Bolton.—Electricity Committee :—

Boiler feed pump at the Back-o'th'-Bank generating station.—G. & J. Weir, Ltd.

London.—According to the *Financial Times*, Messrs. Cammell, Laird & Co., have received orders from the London Electric Railway Co. for trailer cars, and from the Central London Railway Co. for bogies. These orders will be executed at the new works in Nottingham, which the company is taking over from the Government.

Sunderland.—Corporation :—

Cables.—B. I. & Helsby Cables, Ltd.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, November 14th. At 39, Victoria Street, S.W. At 7.30 p.m. Paper on "Irrigation Engineering in Burma," by Mr. A. P. Morris.

Friday, November 21st. At the Royal Society of Arts, John Street, Adelphi, W.C. At 7 o'clock. Annual general meeting. Paper on "The Limitation of Electric Tramways," by Mr. W. A. Tookey.

Institution of Electrical Engineers.—Monday, November 17th. Informal meetings. At the Chartered Institute of Patent Agents, Staple Inn Buildings, W.C. At 7 p.m. Discussion on "Engineering Advertising," to be opened by Mr. W. E. Warrilow.

Students' Section.—Friday, November 21st. At the City and Guilds (Engineering) College, South Kensington, S.W. At 7 p.m. Opening address by Mr. A. P. Trotter.

Wireless Section.—Wednesday, November 19th. At 6 p.m. At the Institution of Civil Engineers, Gt. George Street, S.W. Paper on "The Design of Multiple Stage Amplifiers using three Electrode Thermionic Valves," by Prof. C. L. Fortescue.

Scottish Centre.—(Students' Session).—Friday, November 14th. At the Royal Technical College, Glasgow. At 7.30 p.m. Opening address by Mr. F. H. Whysall.

(North-Western Centre).—Tuesday, November 18th. At the Engineers' Club, Manchester. At 7 p.m. Address by the chairman, Mr. J. A. Robertson.

(South-Midland Centre).—Wednesday, November 19th. At the University, Birmingham. At 7.30 p.m. Address by the chairman, Dr. C. C. Garrard.

(Irish Centre).—Thursday, November 20th. At the Royal College of Science, Upper Merrion Street, Dublin. At 7 p.m. Discussion on "Mr. C. H. Wordingham's Address."

Institution of Civil Engineers.—Tuesday, November 18th. At Gt. George Street, S.W. At 5.30 p.m. Paper on "Admiralty Harbour, Dover," by Mr. M. F. Wilson.

Industrial League and Council.—Tuesday, November 18th. At 4.30 p.m. At the Guildhall, London, E.C. Address on "The Industrial Outlook," by the Right Hon. Sir Auckland Geddes, M.P.

Royal Society of Arts.—Wednesday, November 19th. At 4 p.m. At John Street, Adelphi, W.C. Opening address on "Science and Industry," by Sir H. T. Wood, Vice-President and chairman of the Council.

Belfast Association of Engineers.—Thursday, November 20th. At the Municipal Technical Institute. At 7.45 p.m. Paper on "Fuels," by Prof. H. Wren.

Electro-Harmonic Society.—Friday, November 21st. At 8 p.m. At the Holborn Restaurant (Venetian Chamber). Concert. Ladies' night.

Institution of Mechanical Engineers.—Friday, November 24th. At Storey's Gate, S.W. At 6 p.m. Paper on "The Present Position of Mechanical Road Traction," by Mr. G. C. Conradi.

NOTES.

A Spanish Trade Union Dissolved.—Reports from Barcelona, where there is a lock-out of 34,000 men, state that complete order prevails. In consequence of the unyielding attitude of the employers' federation, the central organisation of the local Trade Unions, known as the "One Big Union," will be dissolved, and the seals and archives deposited in the offices of the Civil Governor.

Geological Research.—The Geological Survey of Great Britain and the Museum of Practical Geology, Jermyn Street, S.W., have been transferred for administrative purposes from the Board of Education to the Department of Scientific and Industrial Research as from November 1st. Correspondence with reference to the work of the Survey should be addressed, as heretofore, to the Director of the Survey and Museum, Jermyn Street, S.W.

Royal Naval Division Signal Company Reunion Dinner.—A very successful dinner was held on the evening of November 5th at the Holborn Restaurant, the first, it is hoped, of many. The following were present, Mr. A. C. Branch in the chair :—Messrs. H. A. Edger, G. C. Allingham, R. O. Martin, T. H. Soloman, H. S. Housden, E. Barlow, C. S. Williams, S. H. Freeman, G. F. Boxall, E. J. New, B. H. Leeson, C. E. Monks, R. D. Binnie, L. S. Wallis, A. G. Hilling, H. A. Brimelow, C. A. Stephens, S. P. Barnes, C. F. Edwin, F. C. Curtis, B. E. G. Mittell, H. W. Booth, T. Riley, J. N. Robertson, I. Casewell, J. H. Turner, A. S. Carr, G. W. Hilditch, P. C. Pocock, E. J. Harper, J. L. Dillon, C. W. Erskine, H. W. Moreton, H. H. Curtis, F. D. Ballard, F. T. Hall, J. L. Browne, S. J. Billington, J. Grieg, H. D. Gamble, F. E. Beecham, C. L. Pickup, E. A. Gordon (hon. secretary). The dinner was followed by a discussion and a musical programme.

Spectacular Flood-Lighting at Glasgow.—The most effective item in the Glasgow Corporation Peace Day illumination scheme was undoubtedly the flood-lighting of the beautiful municipal buildings. Seventy-six B.T.H. floodlight projectors, each containing a 1,000-watt half-watt lamp, were employed. The projectors were placed on the roofs of buildings opposite the Town Hall, and were so arranged that the whole façade was uniformly

Exterior of Glasgow Municipal Buildings Illuminated by Means of B.T.H. Floodlight Projectors.

and very brilliantly illuminated. Ten of the lamps were used for lighting the central tower. This installation is believed to be the first of its kind in this country—certainly there has been no earlier attempt on so large a scale. It was of a purely temporary nature, but the floodlight projectors are to be retained by the Corporation, and will be used in the future for a variety of municipal purposes—such as night construction work, fire salvage, street patrols, &c.

Nitrogen Products Committee.—The report of the Nitrogen Products Committee, appointed by Mr. Lloyd George when he was Minister of Munitions, in June, 1916, will shortly be published. The recommendations include proposals for meeting at home a portion of the demand for nitrogen products; proposals for conserving and increasing the output of by-product ammonia from gas works, coke ovens, &c.; for securing the better utilisation of the national resources in coal, and for reducing the consumption of raw coal as fuel.

The main interest in the report lies in the direction of the future development in this country of the fixation of atmospheric nitrogen. The Ministry of Munitions commenced during the war the erection of a factory at Billingham-on-Tees, covering 271 acres. At the conclusion of hostilities work was suspended. The Minister of Munitions is prepared to consider offers for the acquisition of the partly-constructed factory at Billingham, with plant and other realisable assets, from persons or firms in a position to develop successfully the fixation of atmospheric nitrogen. The adequate assurance of the production of nitric acid, &c., for service explosives will be a condition of the transfer.

The Electro-Harmonic Society.—The next concert (ladies' night) will be held at the Holborn Restaurant in the Venetian Chamber on Friday, November 21st, commencing at 8 p.m. Mr. Roger T. Smith (President of the Institution of Electrical Engineers) will preside. The artistes will be :—Miss Clara Simons, soprano; Mr. Walter Glynne, tenor; Mr. Edward Halland, baritone; Mr. Philip Lewis, violinist; Mr. Sivori Levey, humorous and dramatic recital; Mr. T. C. Sterndale Bennett, original humorous songs at the piano; Mr. Bernard Flanders, A.R.A.M., pianoforte solo and accompanist.

The following letter came to hand as we were going to press :—

"I have just received my card *re* the Electro-Harmonic Concert on November 21st, and note with regret that it is proposed to revert to evening dress for ladies' nights.

"After enjoying many concerts in ordinary clothing during recent years, I fail to see why we should now degenerate into pre-war bad habits.

"I have asked Mr. Lane that the question may be put to the vote on November 21st and also on December 12th, and trust that all members in favour of rational dress will turn up, and thus save themselves much loss of time and inconvenience in the future.

"E. Stanley Hayshaw.

"London, S.E., *November 12th*, 1919."

A Welsh Water-power Competition.—We have not hitherto associated engineering problems with the Welsh National Eisteddfod, an institution which we have always regarded with the respect due to its age and its ideals, but of the working of which we have little knowledge. It is, therefore, with pleased surprise that we learn from Mr. J. P. Gregory, of Rugby, that the first item on the programme of subjects for competition for prizes offered by the National Eisteddfod Association is an essay on "The Use of the Water Power of Wales for the Development and Advancement of Welsh Industries," the prize (given by the proprietors of the *Western Mail* through the Association) being £100. The adjudicators are Sir L. W. Llewellyn, K.B.E., Prof. T. J. Jehn, and Mr. J. P. Gregory. The prize is by far the highest offered, except one for choral singing. Particulars as to the conditions, &c., can be obtained from the general secretary, Mr. D. Arthen Evans, "Glyn Geraint," 15, Somerset Road, Barry (catalogue price 11d. post free); the meeting is to be held on August 2nd—6th, 1920, at Barry. All entries must be completed by May 24th, 1920.

Educational.—*Science* states that a co-operative course in electrical engineering, in which the General Electric Co. (U.S.A.), combines with the Institute, has been established at the Massachusetts Institute of Technology. Students undertaking this work will have before them a course of five years in length. The first two are identical with the regular course in electrical engineering, and the last three will be divided between instruction in theory at the Institute and instruction in practice at the West Lynn Works of the General Electric Co. The Institute instructing staff has been strengthened by the addition to its electrical faculty of Prof. Timble, who will be alternately at the Institute and at the works with the students. The successful completion of the course will lead to a degree of master of science. This undertaking, which affords to the students the practice of the most important and largest kind of commercial work, is undertaken by the General Electric Co., in order that it may have a supply of properly trained young men for its managers and superintendents.

Flood Lighting.—Testimony to the value of flood lighting for protective purposes was provided during the recent railway strike by the use of B.T.H. projectors at Lots Road power station. These projectors, described some time ago in our "New Devices" columns, are mounted on tripod stands, and can be swivelled horizontally and vertically; each projector is equipped with a 1,000-watt Mazda half-watt lamp. It was found that two or three watchmen, each having under his control a flood-light projector, could maintain close observation over the whole danger zone—that is to say, the area from which interruption was likely to proceed. The slightest movement could be clearly seen at a distance of 300 or 400 ft. Obviously, the use of floodlight projectors for protecti*re* lighting has considerable advantages, since one watchman, so equipped, has a large radius of effective observation. Another good point about flood lighting is the rapidity with which the projectors can be installed in case of emergency, the only preliminary necessary being the prevision of leads from the nearest available source of energy.

The Ministry of Transport.—*The Times* states that the newly-constructed Ministry of Transport is busily engaged at present upon its organisation. There are to be nine separate departments. The heads of these departments are :—

Chief Mechanical Engineer.—Colonel L. Simpson.
Director-General of Civil Engineering.—Sir A. Gibb.
Director-General of Development.—Sir C. de Bartolomé.
Director-General of Traffic.—Sir P. Nash.
Secretary and Solicitor.—Sir F. Dunnell.
Director-General of Finance and Statistics.—Sir G. Beharrell.
Director-General of Public Safety and General Purposes.—Sir W. Marwood.
Director-General of Roads.—Sir H. Maybury.
Director-General of Transport (Ireland).—Mr. H. G. Burgess.

The organisation of the Civil Engineering and the Roads Department has been delayed, as Treasury authority for these departments has not yet been received.

Inquiries.—Makers of the "New Vesper" pillar for lamp radiators, Tungar rectifiers, &c., are asked for.

Fatality.—Oswald Guest, aged 26, was seen to stumble whilst following his employment on an electric charger at the Cleveland Steel Works, Middlesbrough, on November 7th. In falling, he clutched a live wire, and fell to the ground dead.

The Closed Door—Why?—After allowing the Press access to the Gas and Electricity Committee's meeting for several years, the Middlesbrough Corporation decided last Monday (November 10th) that the Press should not be admitted in future, "owing to the important negotiations and discussions which take place from time to time."

Appointments Vacant.—Instructor in electrical engineering and electrical installation work (£220) for the Croydon Education Committee; assistant telegraph engineer (£250 + war bonus) for the Government of Uganda; lecturer and demonstrator in electrical engineering (£300, rising to £400) for the University of Liverpool; junior shift engineer (£186) for the Crewe Corporation electricity works; telegraph inspectors (£160, rising to £200 + £70), electrical mechanicians (£200 + £65), for the Posts and Telegraphs Department in the occupied Territory of German East Africa; switchboard attendant (73s.), for the Burnley Borough Council Electric Lighting Department. See our advertisement pages to-day.

In our "Official Notice" pages last week in the advertisement relating to the appointment of a station engineer for Cape Town, the reference to age should have read "who must *not* be over 40 years of age."

A Graphic Indicator of Pulsations.—Referring to our recent remarks on the measurement of noise, Mr. N. D. Blagdon Phillips, A.M.I.E.E., sends us the following particulars of an apparatus intended for use in connection with physical and other research, by application to any body or structure whose minute movements or vibrations it is desired to investigate.

The means adopted is the movement of a spot of light upon a rotating drum or a screen. The principle will be understood by reference to the diagram (fig. 1), in which D represents a diaphragm or member adapted to receive the vibrations in question. Attached to D is a fine wire W, made fast at its other end to the adjustable fixing F. On this wire is a small bobbin A, to which is attached a second wire W_1, held in tension by the spring S.

A small mirror M, pivotally mounted at P, is actuated by a small arm on P attached to W_1. It will be seen that W is not quite straight, but is pulled by W_1 so as to form a wide angle at A. By this means a very small movement of D causes a magnified movement of M.

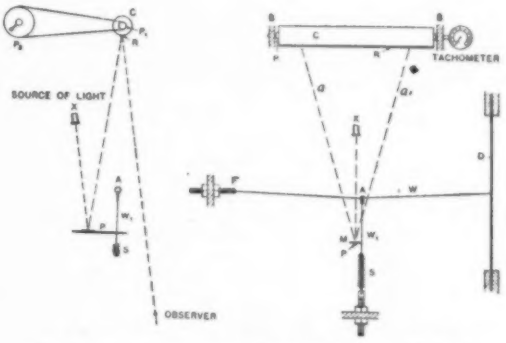


Fig. 1. Graphic Indicator. Fig. 2.

A beam of light is directed on to the mirror, and any movement of the latter will cause the beam of light to move over a corresponding angle, represented by the dotted lines a, a_1; this movement of the beam would in most cases be too rapid to allow of counting its frequency, although its amplitude might be noted. The frequency, however, can be ascertained by mounting a cylinder, or drum, C, in bearings B, B, on one end of which is a pulley P_1 driven from a larger pulley and handle P_2. This drum has a dull black surface, except at one portion of its periphery B, where there is a narrow strip of white extending its full length. When the mirror oscillates, the spot of light is thrown backwards and forwards on the drum, which is then rotated by means of the driving pulley P_2, causing the observer to see the spot of light at intervals, *i.e.*, once each revolution of C, and the position in which he sees the spot on B may vary according to the circumstances, depending upon the phase difference of the movements of M and B. The observer will then adjust the speed of C until the spot appears to be stationary, when the speed of C can be read on the tachometer, and this will give the periodicity of D.

The left-hand view in the diagram shows in elevation the path of the beam of light from its source to the eye of the observer.

If it be desired further to investigate the characteristics of the pulsations, the drum C may be replaced by a photographic plate made to pass, at known speed, in front of the spot of light; or the apparatus might be adapted for use with the oscillograph, so as to render the wave form at once apparent.

Institution and Lecture Notes.—Institution of Electrical Engineers.—The syllabus of meetings of the new session of the Irish Centre, which opened on October 16th at Dublin with the chairman's address, is as follows:—

November 20th.—Discussion on Mr. C. H. Wordingham's address.
December 18th.—Water Power, Mr. T. C. Roberts.

The first ordinary meeting of the North-Eastern Centre was held at Newcastle on October 20th, when the Chairman, Mr. W. Cross, delivered his inaugural address; on Monday evening last Dr. W. M. Thornton lectured on "Electrical Underwater Signalling." Other arrangements are as follows:

November 24th.—Wireless Telegraphy in the Mercantile Marine, Mr. W. D Owen.
December 8th.—Subject to be announced later.

The opening meeting of the North-Midland Centre was held on Tuesday last at the Hotel Metropole, Leeds, when the Chairman, Mr. W. M. Selvey, delivered his inaugural address. A smoking concert followed. The programme for the first part of the session is as follows:—

November 25th (Sheffield).—Visit of the President, Mr. R. T. Smith. Discussion on the Use of Electrical Machinery in Goods Stations and Yards, to be opened by the President.
December 9th (Bradford).—Discussion on the Linking-up Report, to be opened by Mr. T. Roles.
January 13th, 1920 (Leeds).—Large Power Transformers, by Mr. A. G. Ellis and Mr. J. L. Thompson.

The new session of the Scottish Centre was opened at Glasgow on Tuesday last with the Chairman's (Mr. W. B. Hird) inaugural address. The syllabus includes the following:—

December 9th (Glasgow).—Scientific Works Management, Mr. J. M. Scott-Maxwell.
January 13th (Edinburgh).—

The first meeting of the North-Western Centre is to be held at the Engineers' Club, Manchester, at 7 o'clock on Tuesday next (November 18th), when Mr. J. A. Robertson will deliver his inaugural address. Other arrangements for the session are as follows:—

December 2nd.—Discussion on Electricity Supply.
December 16th.—Scientific Works Management, Mr. J. M. Scott-Maxwell.
January 13th, 1920.—
January 20th.—

The inaugural address of the chairman of the South-Midland Centre (Dr. C. C. Garrard) is to be delivered on Wednesday next, November 19th, at 7 p.m. at the University, Birmingham. Other events in the programme are:—

December 3rd.—Dielectrics, Mr. G. L. Addenbrooke.
December 17th.—Scientific Works Management, Mr. J. M. Scott-Maxwell.
January 14th, 1920.—Eddy Current Losses in Stator Windings, Mr. H. W. Taylor.
January 15th.—Joint meeting with Midland Junior Gas Association for discussion on "The Uses of Gas and Electricity for Heating and Power."
January 28th.—Failures of Turbo-generators and Suggestions for Improvements, Mr. J. Shepherd.

On December 1st, Mr. W. A. Chamen will address the members of the Western Centre at the Merchant Venturers' Technical College, Bristol.

The newly-formed Preston Centre of the Institution (Mr. J. F. Simpson, borough tramway engineer, secretary), held its first general meeting last week, when Mr. J. Connor, chairman, gave an interesting address on "The Nation's Concern in the Utilisation of Fuel." There was an attendance of 100, including several visitors.

Birmingham Electric Club.—On Saturday evening last a paper was read by Mr. T. Pettigrew, of London, on "Automatic Telephones for Works' Offices, &c." The paper was illustrated by lantern slides, working parts, and by complete equipments installed in the lecture room. The paper dealt with two main types: an automatic telephone system arranged for 100 lines, but upon which the conversation efficiency factor could be varied; and a new automatic telephone system known as the "Select-o-Phone" system, which has a large number of advantages.

Institution of Civil Engineers.—The 101st session of the Institution of Civil Engineers was opened on the 4th inst. at Westminster, when Sir John Purser Griffith delivered his presidential address, and presented the awards made by the Council for papers dealt with during the year. There was a large attendance. The president said that years ago it was his privilege to submit for their consideration some of the economic problems in connection with the handling of raw materials and merchandise at ports and other large centres of traffic. He had endeavoured to show that the old term "labour-saving appliances" should be replaced by that of "labour-aiding appliances," because they did not aim at reduction of employment, but at a greater individual output. He little thought then how soon the problem would have to be faced in an acute form. The declaration of large dividends, and the tax on excess profits, have led the workman to believe that he was not receiving his fair share of the earnings of the industry. It appeared that the only remedy was a wide adoption of co-operation, co-partnership, or profit-sharing, which would ensure the workmen's participation in the prosperity of the industries in which they were engaged. The coal panic of the past few years had drawn attention to the unused peat deposits in the United Kingdom. It was estimated that the Irish bogs contained between 3,500,000,000 and 4,000,000,000 tons of anhydrous peat, or 5,000,000,000 tons of air-dried peat. At present about 6,000,000 tons of peat per annum were burned as fuel in Ireland, and over 4,500,000 tons of coal imported. If this coal were replaced by peat fuel at the rate of two tons of air-dried peat to one ton of coal—that was, about 9,000,000 tons of air-dried peat—the total consumption of peat in Ireland would be about 15,000,000 tons per annum, and the peat deposits would be sufficient to satisfy the fuel and power requirements of the country at the present rate of consumption for more than 300 years. The difficulty of winning would increase, due to the increasing distances of the coal faces from the pit mouth, the longer time the men would take to get to their work, and the shorter time they would spend at the working face. Output under these conditions must decrease and price of coal rise. For these reasons the development of our peat and water-power resources was an urgent and pressing need. Neither of these great problems could be dealt with unless the State took action, and removed the obstacles which excluded the possibility of private development.

Royal Institution.—At a general meeting of the members, on November 3rd, thanks were returned to Mr. Richard Pearce for his donation of £100 to the fund for the promotion of experimental research at low temperatures; and to Mr. Robert Mond for his gift of laboratory material. The Right Hon. Lord Rayleigh, Mr. L. Griffin, Lieut.-Col. A. E. Le Rossignal and Mr. E. Basil Wedmore were elected members.

Association of Mining Electrical Engineers.—The Yorkshire branch held its first meeting of the new session at Wakefield on November 1st. In his inaugural address the President (Mr. Roslyn Holiday) appealed to the young members to take an active part in the discussions and deliberations of the Association. A paper was read by Mr. J. R. Haigh on the installation of electrical plant in collieries. He advocated a steam pressure at collieries of 150 lb. per sq. in. as a minimum—the majority of collieries at the present time were working at 50 to 70 lb. per sq. in., which was far too low. Exhaust-steam turbines effected an immense saving, but more efficiency would be gained by dispensing with the old winding engines and replacing them with electric winders. The first cost would be heavy, but the outlay would be amply repaid in a few years' time. Water-tube boilers working at 150 lb. with super-heated steam and economisers, the steam feeding into a high-pressure turbine for the generating of the whole of the electricity at the colliery, was the ideal system, and he thought that the Government should compel all new collieries to be equipped on these lines. Steam should only be used to drive the turbo-generators.

Paisley Association of Electrical Engineers.—Mr. W. Blair Smith, Corporation electrical engineer, Paisley, in his presidential address to this Society, spoke of the present condition of the electrical industry, and dealt with the proposed formation of larger distributing areas of supply throughout the country as provided for in the new Electricity (Supply) Bill. The new conditions, he said, would bring about a betterment of the whole supply business. Other matters dealt with included the increase of output improvement of load factor, the standardisation of systems, and the more thorough training of engineers, all of which, it was claimed, would have a beneficial effect on the industry of the country.

Prof. A. H. Gibson delivered his lecture on "Water Power Possibilities," with special reference to the Tummel Valley electrical scheme, to the members of the Dundee Engineers' Institute.

The Chinese National Wireless Co.—In June the formation of the Chinese National Wireless Co. was announced. The board of directors has since been appointed as follows: Vice-Admiral Chen Ngen-tao, chief of the executive board, Ministry of the Navy, Peking; Lieut.-General Ting Ching, until recently director-general of military operations, Ministry of War, Peking; Lin Chih-hsin, a Chief du Bureau of the Ministry of Communications, Peking; Godfrey C. Isaacs, managing director of Marconi Wireless Telegraph Co., Ltd., London; T. A. Barson, chairman of the Peking Syndicate, Peking; and A. H. Ginman, representative in China of Marconi's Wireless Telegraph Co. The company was formed as a result of the agreement made between the Chinese Government and Marconi's Wireless Telegraph Co., London, and is a joint stock limited liability company created to manufacture and deal in wireless telegraph and telephone apparatus, material, and supplies, and to repair and maintain wireless installations now existing and hereafter to be established. The capital is set down as £700,000. The agreement stipulated that £200,000 of the capital was to be paid up upon signature of the agreement, one-half by the Marconi Co., and the other by the Chinese Government, the latter having the option, after 20 years, either to buy out the Marconi or sell out its own shares. The Marconi Co. grants to the Chinese company the right to use in China, so long as it is a party to the terms and conditions of the agreement, all the Marconi Co.'s patents, rights &c., in return for one-third of the net profits, though this payment will be discontinued should the Chinese Government eventually buy up the entire Chinese company. The Chinese Government also has the right, at any time, to abolish the one-third distribution of profits to the Marconi Co. by the payment of a lump sum to be determined by negotiation, but not to exceed £300,000. The company is to utilise materials produced in China in preference to imported materials in all cases in which such materials are neither lower in quality nor higher in price than the imported materials. Chinese will be employed on the personnel as far as possible, and as soon as the company's works are in operation a school will be established for the technical education of students, the expenses of the school to be borne by the company.—*T. & T. Age.*

Electric Soldering Irons.—Following on Mr. C. Turnbull's article on the construction of electric soldering irons, we have received from him the heating element of an iron which has burnt out, and we reproduce herewith a photograph of it. The screwed portion of the copper rod, it will be seen, has been worn and corroded away in the manner described in his article, with disastrous consequences to the element. The design of the tool is obviously inherently bad, and betrays a lamentable lack of workshop experience on the part of its author. Even if an intimate contact could be obtained in the first instance between the screw and the head, the design would still be wrong, for the continual expansion and contraction of the two parts must inevitably destroy that close contact in a short time, and bring about an excessive heat

Burnt-out Soldering Iron Element.

gradient across the surfaces, overheating the element and oxidising the screws; eventual breakdown is then a foregone conclusion. Mr. Turnbull's design, in which the shank and the head are made in one piece, offering the minimum resistance to the flow of heat, is obviously the correct engineering solution of the problem, and it presents no serious difficulties in manufacture.

The moral of the matter, to our mind, is that manufacturers who receive complaints regarding their products, emanating from reliable sources, ought not to permit them to be dealt with by the clerical staff, but should see that they are brought to the notice of their competent technical staff.

Hours of Work.—In Mr. R. E. Graves' chapter, in the annual report for 1918 of H.M. Chief Inspector of Factories, he reports that in 1913 the actual hours of work in different trades were considerably below those permitted by the Acts. The outbreak of war, however, gave rise to a considerable extension of hours even beyond those ordinarily allowed. For a time the lengthened hours had, generally speaking, the desired effect of increasing output, though not in full proportion to the hours worked, but it gradually became apparent that such hours were not profitable in the long run. Experience led to a further reduction in hours, and an interesting feature was the increasing number of cases in which work before breakfast was abandoned. The shortening of hours was mainly achieved by: (1) The one-break day system, under which work commences after breakfast and only one meal time is allowed; (2) the two day-shift system, under which work is carried on by two shifts of workpeople, each working from six to eight hours daily; (3) the five-day week system, under which no work is done on Saturday. During the past year, the last-named system has been adopted in numerous works in a wide range of industries throughout the country. It is remarkable how few cases are recorded throughout the reports of firms which, having once tried the new system, have reverted to the old. In practically all the cases mentioned, the reversion was due solely to objections on the part of the workpeople. The chief objections appear to be: (i) That breakfast before starting means increased consumption of coal and gas; (ii) that the interval between breakfast and dinner is too long, unless a short break is allowed during the morning spell, or light refreshment is sent round; (iii) that confusion is caused in the home, and hardships to the housewife. The two day-shift system consists in two day shifts of six to eight hours each, usually between 6 a.m. and 10 p.m. Generally, the second shift takes over from the first without any break, but sometimes there is a short interval between. The inspectors report that in very few cases have any objections been raised by the workpeople; but that, on the contrary, those questioned at several factories have expressed themselves well pleased with the system. They also report that no particular administrative difficulties have been experienced. Individual works in a fairly wide range of industries have found it convenient to adopt a five-day week, with no work on Saturday, but there are no signs at present that it is likely to be very attractive generally either to employers or workpeople.

OUR PERSONAL COLUMN.

The Editors invite electrital engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Engineers.—Mr. J. Townley, acting borough electrical engineer at Barnsley, has been appointed chief assistant electrical engineer of the Sunderland Corporation Electricity Department, at £522 per annum, in succession to Mr. S. R. Windle, who has been appointed electrical engineer of the Doncaster Corporation electricity works.

General.—We learn from Mr. W. M. Mordey that Major A. E. Levin, T.D., R.E. (T.), who was for some years associated with him and his late partner, Mr. R. A. Dawbarn, has now returned from overseas military service, and has joined him as partner. The firm will be known as Mordey and Levin, and will carry on practice at 82, Victoria Street, Westminster, S.W. 1.

Mr. W. A. Reynolds has been appointed to succeed Mr. C. W. U. Adamson, who is now in England, as Victoria manager for Messrs. Babcock & Wilcox, Ltd. Mr. Reynolds was sent from head office to supervise the erection of the boiler house equipment at the Newport power station. Mr. A. E. Pepper, consulting electrical engineer, formerly associated with Messrs. Kay, McNicol & Co., Sydney, has been appointed manager of Messrs. W. G. Watson & Co., Ltd.—*Commonwealth Engineer.*

Mr. F. Chambers, the foundry general manager of the Stanton Ironworks Co., Ltd., is retiring from that position, and his place is being taken by Mr. P. H. Wilson. Mr. Chambers is retaining his seat on the Stanton board, and will continue to act as consulting engineer to the company in connection with their foundry business.

The Rt. Hon. Lord Herschell, K.C.V.O., has been elected a director of Marconi's Wireless Telegraph Co., Ltd., and the Marconi International Marine Communication Co., Ltd.

Mr. W. E. Sowter, Mayor of Bedford, in inspector of the electrical section of the telegraph department of the Midland Railway between Leicester and Southend, and is chairman of the Corporation Electricity and Street Lighting Committee.

Mr. Greenslade, chief of the electrical engineering department, Cork Technical School, has resigned in order to take up another appointment.

Coun. J. Calvert, who had conferred upon him the Freedom of Middlesbrough last Friday (7th) on relinquishing the mayoralty after four years, has been chairman of the Gas and Electricity Committee since 1910.

Lieutenant J. E. Chamberlain, City of Edinburgh Fortress Engineers (Electric Lights Companies), has been granted the local rank of captain whilst commanding a company, with effect from August 1st. Captain Chamberlain was gazetted to the corps in August, 1916.

Warrant Telegraphist H. J. Mason has been appointed to the *Africander* for charge of Bathurst wireless station.

In the Nottingham elections Mr. R. H. Swain, who had filled the office of chairman both of the Electricity and Tramways Committee, was defeated. The Labour Party contested nine seats and won seven, the opposition to Mr. Swain being founded partly upon objection to present high tramway fares and the want of success attending the electricity undertaking. Mr. Swain has been acting also as chairman of a committee of East Midland authorities which has been constituted to further an extensive scheme of electricity supply.

Mr. J. H. Davies, registrar of the University College of Wales, has been elected principal in succession to the late Dr. T. F. Roberts.

Congratulations to Alderman Duncan Watson upon his election as Mayor of St. Marylebone Borough Council.

Mr. G. T. Milne, O.B.E., who was in 1912 appointed H.M. Trade Commissioner in Australia, and in 1917 H.M. Senior Trade Commissioner in Canada and Newfoundland, has been appointed commercial secretary (Grade I) at H.B.M. Legation, Havana. He is proceeding from Montreal to Havana on November 30th.

Mr. N. T. Tate has been appointed chief electrician at Messrs. John Bowes & Partners' Collieries at Marley Hill (Co. Durham).

Sir Auckland Geddes, the President of the Board of Trade, has appointed Captain G. T. Ramsden, M.P., to be his Parliamentary Private Secretary.

Mr. R. E. Entheven, C.I.E., has concluded his work under the Board of Trade as Controller of Import Restrictions, and his services have accordingly been replaced at the disposal of the India Office.

Colonel W. F. A. Wadham, V.D., who was vice-chairman of Barrow Corporation Electricity Committee, 1909-18, and succeeded Alderman Smith as chairman until November 1st, when he lost his seat as a councillor, was on Monday last co-opted by the Town Council and elected Mayor of Barrow. It is hoped, therefore, that he will now continue his chairmanship of the Electricity Committee.

Obituary.—Mr. E. S. Moulden.—The death occurred recently in Adelaide, S. Australia, of Mr. E. S. Moulden, A.M.I.E.E., A.M.A.I.E.E., A.M.I.Mech.E., aged 36, chief assistant electrical engineer to the Adelaide Municipal Tramways Trust—*Commonwealth Engineer.*

NEW COMPANIES REGISTERED.

Lighting and General Traders, Ltd. (160,326).—Private company. Registered November 5th. Capital, £4,000 in £1 shares. To take over the business carried on by C. B. Bennett at 7, Butler Street, Moor Lane, E.C., as the "Lighting Accessories Co.," and to carry on the business of lighting accessories merchants, &c. The subscribers (each with one share) are: C. B. Bennett, 7, Butler Street, E.C. 2, lighting accessories merchant; J. G. Kirkland, 45, Bedford Road, Harrow, electrical manager. The first directors are not named. Qualification, 5 shares. Solicitors: Armitage and Armitage, 53 and 54, King William Street, E.C.

Dewhurst and Partner, Ltd. (160,314).—Private company. Registered November 5th. Capital, £3,000 in £1 shares. To carry on the business of ironfounders, mechanical engineers, manufacturers of electrical apparatus and implements, &c. The subscribers (each with one share) the: H. Marryat, 28, Hatton Garden, E.C. 1, engineer; M. Dewhurst, Sandown, Southwood Road, New Eltham, engineer. The first directors are: H. Marryat and M. Dewhurst (both permanent). Registered office: 28, Hatton Garden, E.C.

Pimm & Burrows, Ltd. (160,332).—Private company. Registered November 5th. Capital, £1,000 in £1 shares. To carry on the business of consulting, mechanical, gas, electric light, and electrical engineers, iron and brass founders, tool makers, agents for the sale, purchase and hire of and dealers in machinery, &c., and to enter into an agreement with A. W. Pimm and L. Burrows. The subscribers (each with one share) are: A. W. Pimm, 36, Southwark Bridge Road, S.E. 1, engineer. L. Burrows, 2, Queensway, Lincoln, engineer. The first directors are: A. W. Pimm and L. Burrows. Solicitors: G. and G. Keith, 18, Southampton Street, W.C. Registered office: 36, Southwark Bridge Road, S.E. 1.

Vickers-Brazil, Ltd. (160,367).—Private company. Registered November 6th. Capital, £10,000 in £1 shares. Objects: To carry on the business of engineers, shipbuilders, armament manufacturers, electricians, &c. The subscribers (each with one share) are: F. J. Abbott, 47, North View Road, N. 8, clerk; E. J. Alldis, 18, Macdonald Road, E. 7, clerk. The first directors are to be appointed by the subscribers. Solicitors: Linklater & Co. Registered office: Vickers House, Broadway, Westminster.

Marconi Scientific Instrument Co., Ltd. (160,228).—Private company. Registered November 1st. Capital, £12,000 in £1 shares. To carry on the business of electricians, engineers, manufacturers of telegraphic apparatus, &c. The subscribers (each with one share) are: H. W. Allen, Camborne, Langley Park Road, Sutton, company director; W. W. Bradfield, 1, St. James' Place, S.W., company director. The first directors are: H. W. Allen, W. W. Bradfield, W. W. Drury, C. Mitchell and A. W. Ward. Secretary: A. W. Ward. Solicitor: G. Rendel Bishop, Marconi House, W.C.

Compression Starter and Switchgear Co., Ltd. (160,220).—Private company. Registered November 1st. Capital, £12,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in motor starters, dynamos, motors, switchgears, motor cars, electrical cars, and electrical accessories of all kinds, general electrical and motor engineers, &c. The subscribers (each with one share) are: R. Lomax, Brook Villa, Stockport, electrical engineer; G. B. Morten, Glebe Cottage, 38, Hall Street, Stockport, cotton and cotton waste merchant; T. N. Robinson, 55, Avondale Road, Edgeley, Stockport, electrical engineer. The first directors are: R. Lomax, G. B. Morten, and T. N. Robinson (managing director). Qualification, 1,500 ordinary shares. Solicitors: F. Newton & Son, 85, St. Petersgate, Preston. Registered office: Penny House, Lancashire Hill, Stockport.

Lesco, Ltd. (160,193).—Private company. Registered October 31st. Capital, £20,000 in £1 shares. To carry on the business of manufacturers of electric lamp holders and other electrical and mechanical sundries, &c. The first directors are: V. Hope, The Firs, Whirley Grove, Macclesfield, Cheshire; T. M. Kirkby, White Cottage, Knutsford, Cheshire; J. Messulam, 19, Aughton Road, Birkdale, Southport; F. A. Hilton, Exeter House, Buxton; J. W. Flohr, Mossley, Bramhall, Cheshire; W. O. Ingham, Stanley Lodge, Forton, near Garstang, Lancs.; C. H. Ingham, Overton, Seddon Road, Hale, Cheshire. Secretary: J. W. Flohr. Registered office: Lloyd's Bank Buildings, King Street, Manchester.

Hyde & Thomson, Ltd. (160,322).—Private company. Registered November 5th. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical engineers, manufacturers of and dealers in machinery for use in connection with the generation, distribution, supply, accumulation and employment of electricity, india-rubber manufacturers, steel and iron merchants, &c. The subscribers (each with one share) are: A. W. Hyde, Queen's Dock Chambers, Hull, electrical engineer; N. K. Thomson, Hamilton House, Totley Brook Road, near Sheffield, electrical engineer. The first directors are: A. W. Hyde and N. K. Thomson (both permanent, subject to holding 100 shares each). Solicitor: T. H. Goodwin, 15, Coleman Street, E.C.

Eyquem Sparking Plugs, Ltd. (160,253).—Private company. Registered November 3rd. Capital, £10,000 in £1 shares. To carry on the business of manufacturers of and dealers in sparking plugs and all component parts, magnetos, electric generators, &c. The subscribers (each with one share) are: A. R. E. Pain, 13, Tellerscot Road, Balham, S.W., solicitor's clerk; H. F. Hellings, 8, South Esk Road, Forest Gate, E. 7, solicitor's clerk. The subscribers are to appoint the first directors. Registered office: 2, Gerrard Place, W. 1.

Reavell-Mossay Pneumatic Tool Co., Ltd. (160,298).—Private company. Registered November 4th. Capital, £5,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in pneumatic and other tools, implements, machinery and apparatus, mechanical, hydraulic, electrical and consulting engineers, &c., and to enter into (*a*) a licence to be granted to the company by the Societe Anonyme des Ateliers Leonard Recour of first part, F. Eloy of second part, and the company of the third part; (*b*) an agreement with Reavell & Co., Ltd.; and (*c*) an agreement with Mossay & Co., Ltd. The subscribers (each with one share) are: P. A. H. Mossay, 322, Norwich Road, Ipswich, engineer; W. Reavell, Broadwater, Ipswich, engineer. The first directors are: P. A. H. Mossay and W. Reavell. Qualification, £1. Registered office: 7, Princes Street, Westminster.

Greenwell and Irwell Rubber Co., Ltd. (160,288).—Registered November 4th. Capital, £800,000 in 400,000 ordinary shares and 400,000 7½ per cent. cumulative preference shares, all of £1 each, to acquire the businesses of I. Frankenburg & Sons, Ltd., and the Irwell and Eastern Rubber Co., Ltd., and to carry on the business of manufacturers of and dealers in india-rubber and leather goods, woven fabrics, electric cables, hose pipes, belting, boots, shoes, leggings, gaiters and other goods, rubber growers, &c. The minimum cash subscription is 10 per cent. of any shares offered to the public. The first directors are: J. Tinto, Kelvindale, Timperley, Cheshire; M. Frankenburg, 4, Park Lane, Kersal, near Manchester; S. Frankenburg, Brook House, Freshfield, Lancs.; S. T. Rowe, Dunoon, Wilbraham Road, Alexandra Park, Manchester; R. Standing, 221, Urmston Lane, Stretford, Lancs.; R. Colsell, Bury Wood, Sewardstonebury, Chingford, Essex; J. G. Tinto, Kelvindale, Timperley, Cheshire. Qualification, £5,000 ordinary shares. Remuneration, £850 each per annum. Solicitors: Bedell & Driver, 24, Cross Street, Manchester. Registered office: Greengate Rubber Works, Salford.

East Lancashire Motors, Ltd. (160,317).—Private company. Registered November 5th. Capital, £5,000 in £1 shares. Objects: To carry on the business of mechanical, electrical, general and motor engineers, &c. The subscribers (each with one ordinary share) are: W. F. Townend, 17, Brooklands Terrace, Blackburn, cashier; A. R. Potts, 2, Juniper Street, Blackburn, motor engineer. The first directors are not named. Registered office: 19, Railway Road, Blackburn.

A Group of New Telephone Companies.—The South Wales and Monmouthshire Telephone (New System) Co., Ltd., has been registered with a nominal capital of £1,000 in £1 shares. The objects are as indicated by the title. The first directors are: F. T. Jackson, 30, Herne Hill, S.E. 24, manufacturer; C. Cochran, 55, West Regent Street, Glasgow, solicitor. The company is a "private" one. Secretary: F. T. Jackson. Solicitors: W. and W. Stocken, 49, Leadenhall Street, E.C. The registered office is at Hollingsworth Works, Martell Road, West Dulwich, S.E.

The following have also been registered, the particulars being similar to the above, viz.:—

Bristol and West of England Telephone (New System) Co., Ltd. (160,218).
Liverpool Telephone (New System) Co., Ltd. (160,227).
Sheffield Telephone (New System) Co., Ltd. (160,252).

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Yale Electric Power Co., Ltd.—Capital, £20,000 in 3,300 preference shares of £1 each and 668 ordinary shares of £25 each. Return dated August 13th, 1919. 300 preference and 668 ordinary shares taken up. £15,300 considered as paid on 300 preference and 600 ordinary. £1,700 considered as paid on 68 ordinary. Mortgages and charges, £1,750 debenture stock.

CITY NOTES.

German Companies.

The directors of the *Elektrizitats A.G. vorm H. Poege, of Chemnitz*, recommend a dividend at the rate of 17 per cent. for 1918-19, this comparing with 28 per cent. in the preceding year. It is proposed to increase the share capital from 6,000,000 to 12,000,000 marks (£300,000 to £600,000 on pre-war basis).

The Brandenburgische Karbid und Elektrizitats Werke A.G., of Berlin, has declared a dividend at the rate of 7 per cent. for 1918-19 out of net profits of £16,000, as compared with the same rate and net profits of £15,000 in the preceding year. It was stated at the annual meeting to be impossible to foresee the financial results of the Norsk Elektro-Kemisk A.S., which had to contend with special difficulties.

The report of the *Wotan Werke A.G., of Leipsig*, for 1918-19 states that the production was prejudicially affected by the reduction in the length of the working day, strikes, and the disinclination to work, although an improvement has taken place recently. After allocating £9,000 to depreciation, as against £8,000 in 1917-18, the accounts show net profits of £29,000, as compared with £59,000 in the preceding year. A dividend at the rate of 15 per cent. has been declared, as contrasted with 25 per cent. in 1917-18.

The directors of the *Kabelwerk Rheydt A.G., of Rheydt*, reporting on the year 1918-19, states that the undertaking was well employed in general. Including the balance forward the accounts show net profits of £47,000, as compared with £150,000 in 1917-18. By the appropriation of £70,000 from the reserve fund for the tax on war profits, the sum available for disposal becomes increased to £117,000, out of which a dividend at the rate of 30 per cent. has been declared, this contrasting with 40 per cent. in the previous year. The report states that no clear idea can be gained as to the future owing to the scarcity of coal and other raw materials.

The report of the *Berliner Elektrizitats Werke A.G., of Berlin*, whose works in Berlin were taken over by the municipal council a few years ago, states that the Bill for the socialisation of the undertakings of the electricity supply companies could have a considerable influence upon the latter and upon the company's Leopold colliery. The owners must expect and demand compensation according to the intrinsic value of the undertakings managed and developed by them. The compensation hitherto held in prospect, which was based simply upon the payment of the book value, was neither just nor economic. So far the dividends paid by the undertakings closely associated with the company had not experienced any large decline. The net profits in 1918-19 are returned at 4,781,000 marks (pre-war £239,050), as compared with 5,749,000 marks (£287,450) in the previous year, and the dividend falls from 10 per cent. in 1917-18 to 8 per cent. last year.

The Electric Supply Corporation, Ltd.

In his speech at the annual meeting, on November 6th, the chairman (Mr. J. G. B. Stone) said that the gross revenue was £7,238 more than in 1918, but the sum taken into net revenue account was £939 less than the corresponding figure in 1918. A year ago he pointed out that unless they were given power to increase their charges to consumers the increasing cost of coal, wages, &c., would deprive shareholders of any return on their investment, and this was what had happened. They were not

peculiar in that respect; other companies carrying on a similar business were in a like position. Although the Electric Lighting Acts gave unrestricted authority to the Board of Trade to increase maximum rates where a good case could be shown, the practical effect on them of the passing of the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, had been that they could not obtain any increase in their maximum rates of charge unless the increased rates were such as to leave their dividend 25 per cent. below the pre-war rate. They had not yet succeeded even in getting such increases as would give them that reduced dividend, but they hoped to do so, and he trusted that the authorities would enable them to do something better. The pre-war dividend upon which this calculation had to be based was the average of the years 1911-12-13, in their case only 2 per cent., they being in course of development and their plant not fully employed. Unless, therefore, the authorities would agree to revert to the procedure under the Electric Lighting Acts on which the capital was subscribed, they were debarred from earning a proper return on their money, and deprived of the means of extending their operations to fulfil their statutory obligations. Again, in most of their undertakings they had an agreement with the local authority fixing the maximum rate to be charged irrespective of the rate authorised by the order. Although these maximum rates appeared in the old days to be fair and reasonable, they were, under to-day's conditions, much too low. In most cases they were 6d. per unit, whereas a rate of 9d. was frequently allowed by the Board of Trade under present conditions. Certain local authorities were willing to meet them, and had waived their rights under these agreements, but it would probably be necessary to proceed under the Courts Emergency Powers Act in order to get this hardship removed in all cases. In order that shareholders and the public might really appreciate the effect which war restrictions and the enormous increase in coal and wages had had on their undertakings he would give them corresponding figures for 1914 and the past year. In 1914 the balance to net revenue account was £17,883; in 1918 £13,161. If they excluded Dumbarton, where they bought in bulk, and also interest on investments, the comparative figures were: 1914, £10,230; 1918, £2,031; thus they were £8,200 down. In these undertakings in 1914 they supplied 1,416,534 units, whereas in 1918 they sold only 1,261,593 units. The increase in the average selling price was 12 per cent., but on the other hand, the cost of production had risen 78 per cent.

	1914.	1918.	Increase.
Coal ...	£5,040	£9,704	£4,664
Stores ...	£ 565	£ 945	£ 350
Wages ...	£4,385	£7,031	£2,646

The two important holdings which they had in other companies, namely, 30,190 ordinary shares in the Dumbarton Tramways and 4,609 ordinary shares of £5 each in the Hendon Electric Supply, had yielded dividends of 5 per cent. and 13 per cent. respectively. As to the future, the managing director reported a good demand for new connections, and every effort would be made to secure an increase in their charges to a figure which would enable them to earn a reasonable profit after providing for burdens which had been put upon them by the phenomenal rise in coal and wages.

Electro Bleach & By-Products, Ltd.—Meetings are called for to-day at Manchester to consider the proposed increase in the nominal capital from £180,000 to £480,000. It is proposed to issue 80,000 preference of £1 each and 80,000 ordinary shares of 10s. each. In the circular explaining the position the company states that the Government advanced £116,218 for an extension of plant, machinery, and buildings on the company's property at Middlewich, and under the agreement between the company and the Government a sum of £35,891 remains to be repaid, when this plant, machinery, and buildings will become the property of the company. The new plant, machinery, and buildings are now available for the ordinary trade of the company. The company have purchased the whole of the plant, machinery, and buildings owned by the Government on the company's works at Middlewich for £10,000. It is proposed to redeem the whole of the outstanding debentures, namely, £50,500. The balance will be available for extensions and development. Profit figures are given for four years as follows: 1915, £31,492; 1916, £48,942; 1917, £48,068; 1918, £60,751. The preference dividend was 7 per cent. for each of these years. On the ordinary shares for 1915 and 1916 7 per cent. was paid, for 1917 10 per cent., and for 1918 12½ per cent.

Water Softeners, Ltd.—Dividend of 2 per cent., free of tax, for the year; £545 is written off for bad debts and depreciation; £261 for repairs, and £750 is put to reserve for income tax. After deducting the debit balance of £3,721 brought forward, says the *Financial Times*, £86 is to be carried forward.

New Issues of Capital.—The Board of Trade, acting on behalf of the Treasury, have granted a general licence under Defence of the Realm Regulation 30F, permitting issues of capital for which a licence from the Treasury is required under that Regulation.

Drake & Gorham, Ltd.—The report for the year ended June, 1919, states that after payment of all charges, including bonuses due to staff, and providing for contingencies, there is a net profit of £27,136, plus £6,702 brought forward, making £33,839. A dividend of 10 per cent. for the year requires £12,500; goodwill is written down by £5,000; and there is carried forward, subject to deduction for excess profits duty, £16,339. The turnover shows a considerable increase on that of the previous year, which was itself a record, and although a number of war contracts were cancelled the work in hand on June 30th compared favourably with that of the previous year. The business of the wholesale department continues to expand as well as the sphere of its operations. This branch has since been transferred to a separate company, registered as Drake & Gorham Wholesale, Ltd. The Rockingham works, Newington Causeway, has been fully occupied, and shows satisfactory profits. The directors have voted £1,621, being part of the extra remuneration to which they are entitled under the articles of association, towards the staff bonus account. Mr. Holbrook Gaskell, O.B.E., until lately the chief engineer of the United Alkali Co. has accepted a seat on the board.

Erinoid, Ltd.—At the fourth annual meeting, held on November 6th, Mr. Andrew Binnie, criticising the attitude of the Inland Revenue and the Board of Referees, said they drew no distinction between a cash-across-the-counter tea-house and a new and progressive manufacturing industry. They had cramped new enterprises, and in doing so had probably lost more in income tax than they had gained in duty. The accounts of the company for the year showed a decrease of £7,000 in trading profits, due to increased cost of raw material and to increased wages. They might have passed the increase on to the consumer, but theirs was a permanent peace industry with great possibilities, and they preferred not to increase their prices, but to maintain and increase their goodwill at home and abroad. Their accumulated profits had now been crystallised in the form of bonus shares and applied as working capital. There were signs that the year would be a record one. The report, and a dividend of 15 per cent., were passed.

Anglo-Portuguese Telephone Co., Ltd.—Mr. H. Allen presided at an extraordinary general meeting held on November 6th, at which a resolution was passed increasing the capital to £500,000 by the creation of 300,000 shares of £1 each. He said that the time had arrived for the directors to bring forward comprehensive proposals for meeting not only their immediate capital requirements but their prospective needs for the next three or four years. Having reviewed the progress of the company, he said that the issue of £250,000 immediately contemplated just doubled the present capital. Much of the outlay now in contemplation represented work held up during the war, and which must now be energetically prosecuted without further delay. The speaker described the plans of the company for extensions at Lisbon and Oporto for which material, &c., had been ordered and the work of building commenced. The new issue would be offered for public subscription, priority being given to existing shareholders. They were awaiting Treasury sanction to the issue.

Stock Exchange Notices.—The Committee has ordered the undermentioned to be officially quoted:—

Midland Electric Corporation for Power Distribution, Ltd.—40,000 7 per cent. cumulative preference shares of £5 each, fully paid (Nos. 1 to 40,000).

Newcastle-upon-Tyne Electric Supply Co., Ltd.—66,000 additional 5 per cent. preference shares of £1 each, fully paid (Nos. 1,288,287 to 1,354,286).

Application has been made to the Committee to appoint special settling days in:—

Stothert & Pitt, Ltd.—184,085 ordinary shares of £1 each, fully paid (Nos. 1 to 184,085).

And to allow the following to be officially quoted:—

Torquay Tramways Co., Ltd.—120,000 ordinary shares of £1 each, fully paid (special application).

Prospectus.—*The Edison Swan Electric Co., Ltd.*—The prospectus is now before the public offering for sale 360,000 shares of £1 each at 21s. 6d. per share. Applications have already been received from business friends of the company for 110,000 shares, and these applications will be accepted in full. Applications from existing shareholders will receive preferential treatment. The purposes for which the capital is required were described in the speech delivered by the chairman at the recent meeting, and reported in our last issue. The list closed on Tuesday, the issue having been much over-subscribed.

Amazon Telegraph Co., Ltd.—The report for the year ended June 30th, 1919, shows a gross revenue of £83,037, and working expenses amounting to £33,413. After providing £2,579 for income tax, £337 for depreciation of investments, £11,658 for debenture interest, £11,241 for sinking fund, and putting £16,000 to general reserve, a dividend of 4½ per cent., less income tax, is to be paid, leaving £6,775 to be carried forward. Communication between Para and Manaos has been maintained throughout the whole year.

Fuller's United Electric Works, Ltd.—Interim dividend on preference shares for the half-year ended September at the rate of 8 per cent. per annum.

Ruston & Hornsby's, Ltd.—Interim dividend on the ordinary shares for the past half-year at the rate of 5 per cent. per annum, less tax.

West India & Panama Telegraph Co., Ltd.—Interim dividends for the six months to June 30th, 1919, of 6s. per share on both the first and second preference shares.

West African Telegraph Co., Ltd.—Dividend at the rate of 4 per cent. per annum, free of tax.

STOCKS AND SHARES.

TUESDAY EVENING.

THE floods of new issues which are appearing these weeks, and which are supposed to be so numerous on account of the possibility of the Government issuing premium bonds, undoubtedly had some effect in checking business in existing securities. At the same time, this check was so comparatively slight that it has made little difference to the activity of markets where speculation rules. The unexpected rise in the Bank Rate on Thursday last imposed sharp but temporary restraint upon Stock Exchange trade. Investment stocks of the best class fell heavily, dragging with them quotations in the speculative markets also. The latter, however, recovered from the Bank Rate surprise, but upon fresh rumours as to a likelihood of yet another advance this week in the Bank minimum, markets became heavy, and many investment securities are lower on balance.

The armistice anniversary inevitably turns men's minds to what was happening a year ago, and it is interesting to compare a few prices to show the trend of values for the twelve months. City of London shares are now 11⅜, being 27s. 6d. lower, and County ordinary at 9⅛ show a fall of 32s. 6d. Westminsters at 5⅛ are 1⅜ down, and Kensingtons at 4¼ are 10s. easier. Brompton's at 5¼ show a 15s. fall, and so the list might be extended.

Cable shares, on the other hand, are distinctly better. Eastern ordinary at 166 is 3½ up, Westerns at 1⅛ are 10s. higher, and Eastern Extensions at 16½ have gained equally. Marconis have gone up from 4¼ to the present price of 6 7-16. West India and Panama were 1⅜ a year ago, and are now 25s., rather nomnial as a matter of fact, on account of the company passing its dividend; at any rate, it has declared dividends only on the first and second preference in the recent announcement.

Quoting a few industrials, Underground income bonds, now standing at 90½, are a point down. Edisons at 25s. are half-a-crown up. General Electrics at 2 are the equivalent of £2 higher in the old £10 guise of the shares. Henleys at 2¼ have not moved, and India-Rubber shares at 17½ are also stationary. The twelve months have proved profitable so far as Stock Exchange business is concerned, nor is there any particular indication of activity falling away. Stock Exchange men, however, are under no illusion as to the permanent character of any buoyancy in their markets, and they frankly confess that they are glad to have had the opportunity of making a little hay although the sun is not shining.

Underwriters of the Indian Electric Supply and Traction issue were landed with a fair portion of their obligation, and some of them apparently felt aggrieved at the prospectus not being more lavishly advertised. Others, however, possibly older hands at the game, professed quiet amusement at the indignation of the first-named, and as the issue is quite a good one, it is probable enough that when the shares get more firmly placed into the hands of the investors, there will be premiums established on the preference. The Edison-Swan Electric has been offering 360,000 new shares of £1 each at 21s. 6d. The list was due to close on or before to-morrow (Saturday), but the shares were over-subscribed by Tuesday afternoon. The prospectus stated that applications for the purchase of 110,000 shares had already been received from business friends of the Edison-Swan Co., and will be accepted in full. The issue is quite a good one, and it is not likely that anyone who receives an allotment will regret the subscription. At 25s. the old shares are 1-16 lower. Siemens advanced to 29s. 6d. and Babcocks to 3½.

The electric lighting market is not much affected by the more favourable conditions or suggestions put forward in connection with the Government scheme, but these, however have had the effect of causing certain selling orders to be cancelled, and are bound to exercise a strengthening influence upon the market, where they have been received with a good deal of quiet satisfaction. Two or three of the City shares are better, but of the West-End group, Bromptons, with a 5s. fall, are the only shares that have moved. Drake and Gorham, the well-known electrical engineers, have raised their dividend to 10 per cent., which is double the amount distributed two years ago. The balance sheet shows a strong position.

The excitement over Marconis has subsided to some extent, preparatory, of course, to the meeting, at which will be announced the price of issue of the new shares. This meeting is fixed for Thursday in this week. Marconis, after being 6⅛, reverted to 6 7-16, and the subsidiaries are lower, Marines at 3, Canadians 14s. 9d., and Americans 31s. 9d. Expectation is looking for fuller details regarding the exchange of American Marconis into Radio Electric shares. One new preferred of 5 dols. and one new common of unfixed denomination are offered to holders of American Marconi shares. The Anglo-Portuguese Telephone meeting produced an interesting speech, at which the chairman remarked that this was the oldest Anglo-foreign telephone company now in existence. The capital is to be increased to half-a-million sterling by the creation of 300,000 new shares. The company is going to call up instalments very slowly, the idea being to avoid laying too heavy a load upon the company's profits while the new developments are being carried out. The ordinary shares stand at 19s. ex dividend, and the 5 per cent. debenture stock is quoted about 90.

Home Railway stocks have weakened. In addition to the Bank Rate, there are unpleasant labour rumours to depress the prices. British Electric Traction ordinary has gone back to 40¼. Mexicans are flat. Anglo-Argentine Tramways further strengthened. It is confidently hoped that the company will soon start paying off the dividend arrears that have accumulated. The first preference last received a dividend in June, 1917, and the second preference have had nothing since December, 1915. Both classes are £5 shares, and are fully paid. The 5 per cent. and 4½ per cent. debenture stocks have risen to the common level of 69½. Para Electrics are better at 4½, Brazilian Tractions at 60½, Canadian General gained 3 points at 128½, but at 137½ Shawinigans are a point or so down.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1917.	Dividend 1918.	Price Nov. 11, 1919.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	10	8	5¼	— ½	£6 19 4
Charing Cross Ordinary	4	4	2½	—	6 8 0
do. do. do 4½ Pref.	4½	4½	3	—	7 10 0
Chelsea	5	5	3	—	5 0 0
City of London	8	8	11⅜	+ ⅛	7 0 10
do. do. 6 per cent. Pref.	6	6	9½	—	6 9 9
County of London	7	7	9⅛	—	7 5 5
do do. 6 per cent. Pref.	6	6	9½	+ ½	6 9 9
Kensington Ordinary	7	6	4¼	—	6 6 4
London Electric	Nil	Nil	1¼	—	
do. do. 6 per cent. Pref.	5	6	3½	—	8 11 6
Metropolitan	4	5	3⅞	—	7 8 2
do. 4½ per cent. Pref.	4½	4½	3⅝	—	7 1 2
St. James' and Pall Mall	9	10	6¾	—	8 3 4
South London	5	5	3⅛	—	7 8 6
South Metropolitan Pref.	7	7	1	—	7 0 0
Westminster Ordinary	9	8	5⅛	—	7 3 2
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	20½	—⅜	6 12 8
do. Def.	1½	33/6	22	— ½	7 11 0
Chile Telephone	8	8	6⅜	—	5 18 6
Cuba Sub. Ord.	7	7	10½	—	*6 13 4
Eastern Extension	8	8	16½	+ ½	*4 17 0
Eastern Tel. Ord.	8	8	16⅜	+1	*4 16 1
Globe Tel. and T. Ord.	7	8	16⅜	—	*4 17 9
do. do. Pref.	6	6	10½	—	5 17 1
Great Northern Tel.	21	22	36½	—2½	8 6 6
Indo-European	13	13	48 xd	+1	6 13 4
Marconi	20	25	6 7/16	— ½	3 17 8
Oriental Telephone Ord.	15	10	2⅞	—	4 14 1
United R. Plate Tel.	8	8	7⅜	— ½	*5 3 3
West India and Panama	1/3	1/3	1⅛	—	Nil
Western Telegraph	8	8	17½	+ ½	*4 12 1
HOME RAILS.					
Central London Ord. Assented	4	4	58½	—1½	6 16 9
Metropolitan	1	1½	24	— ½	5 4 2
do. District	Nil	Nil	21½	— ½	Nil
Underground Electric Ordinary	Nil	Nil	22	— ½	Nil
do. do. "A"	Nil	Nil	7/-	- 6d.	Nil
do. do. Income	4	5	90½	—2	*5 10
FOREIGN TRAMS, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	4¼	—	7 1 2
Anglo-Arg. Trams. First Pref.	4½	Nil	3¼	+ ¼	—
do. do. 2nd Pref.	—	—	3½	+ ½	—
do. do. 5 Deb.	5	5	69½	+ ½	7 4 0
Brazil Tractions	—	—	60½	+1½	—
Bombay Electric Pref.	6	6	12½	—	4 18 0
British Columbia Elec. Rly. Pfce.	5	5	56	— ½	8 18 6
do. do. Preferrred	Nil	2½	45¾	—	5 10 0
do. do. Deferred	Nil	Nil	41½	—	Nil
do. do. Deb.	4½	4½	60⅝	—1	7 9 6
Mexico Trams 5 per cent. Bonds	Nil	Nil	48	—	Nil
do. 6 per cent. Bonds	Nil	Nil	55	—	Nil
Mexican Light Common	Nil	Nil	25	—5	Nil
do. Pref.	Nil	Nil	30½	—	Nil
do. 1st Bonds	Nil	Nil	59½	—	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	3½	+ ½	*4 12
British Aluminium Ord.	10	10	1½	—	5 14
British Insulated Ord.	25	12	2⅜	—	5 19
Callenders	25	25	8⅜	— ⅜	7 9
,, 6½ Pref.	5	6	5	—	6 10
Castner Kellner	25	20	2½	— ½	7 12 8
Crompton Ord.	7	10	21/6	—	9 5 0
Edison-Swan, "A"	—	10	1½	— ⅛	8 0 0
do. do. 5 per cent. Deb.	4	5	81½	—	6 2 9
Electric Construction	10	10	1½	+ ⅛	8 0 0
Gen. Elec. Pref.	6	6½	20/6	—	6 6 10
do. Ord.	10	10	2	—	*5 0 0
Henley	25	25	2¼	—	5 11 1
do. 4½ Pref.	4½	4½	2½	—	6 4 2
India-Rubber	10	10	17½	—	*5 14 3
Met.-Vickers Pref.	—	—	9	—	5 6 8
Siemens Ord.	—	10	29/6	+6d.	*6 15 8
Telegraph Con.	20	20	25	—	*4 17 0

* Dividends paid free of Income Tax.

THE ENGINEER'S WIFE—FROM HER POINT OF VIEW.

By "ANN ASSETTE."

(*Concluded from page* 602.)

In view of their exalted position, they decide to furnish a house—although the salary is still far below the "absolute minimum."

They set out cheerfully enough, beginning at the best end of the town, among the trim little villas and artistic cottages, which, after all, are a little like the homes they have been used to. Alas! All these "desirable residences" are occupied, and, moreover, "booked" for, apparently, three generations ahead. Gradually they descend, metaphorically and literally, and take "for the present" a dismal house in a dismal street, close to the river, which has a nasty habit of sneaking into the basements every high tide—a house which nobody else happens to want. They decide it would be folly to go to much expense in fitting up such a house. Curtains and carpets must be of the cheapest possible materials, for they will certainly fit no other house. The paint is peeled off the porch in patches. (*There's* a sentence for stammerers.) And there are big holes in the scullery floor.

You can picture Ruth looking round her first home, with a sinking heart, comparing it with the home of her dreams.

Then begins the loneliest time in all her life. Can you imagine the feelings of a girl alone through the whole of a stormy night in a big rambling old house—alone, for the first time in her life? For of course on *that* particular night, the Diesel loses the air in starting up, and the driver loses his head and makes a hash of things . . . just one of the little happenings that every station engineer is used to. . . . Ruth *never* gets used to them!

She does not know a soul in that town. Not a single caller! In such towns the "electric light man's wife" is ranked with the plumber's wife, far, far below the gas manager's lady—who is classed as equal to the schoolmaster's wife—and, of course, not to be mentioned in the same breath as the retired ironmonger's wife, who has a villa with an observatory and a tradesmen's entrance.

They live in the dismal house for five years, and the porch remains unpainted, and the scullery floor unmended for four years and eleven months. For *any* day they may find a more suitable house, and why should a busy engineer spend time and money he can ill afford in improving another man's property for the benefit of another tenant?

Their income will not "run" to maids. Ruth has, perforce, to turn her hand to work for which she is physically unfit. Result—a breakdown. She debates a question which thereafter recurs at intervals of three or four years—"a new costume *or* a visit home"?

She goes home. And the candid sister says, "Good gracious! Is that the *same old hat*? And mercy on us! Whoever makes your clothes? Are there no tailors, then, in the Wild West? Fancy *you* degenerating into a—a *frump*, just because you've got married! If *that's* what marriage does, it's me for the single life."

The visit home is not a success. The conversation gets beyond her reach when it deals with new plays, new books, rising artists. There are no theatres in her little world, and no libraries. And if she talks of her concerns they try hard not to look bored, but they—poor things!—know nothing of alternators and boosters and ampères, and when she refers to "the undertaking" they think she is talking about funerals. . . .

She returns to the "Wild West," and finds that John has managed splendidly, and has burnt every saucepan in the house, and broken half the tea cups and two teapots.

When her first baby is born Ruth is alone. She has discouraged the idea of her mother or sister coming, lest they spy out the nakedness of the land. She has no friend intimate enough to confide in. Her husband promises to be at hand every minute he can spare from his work, but they both realise that when a man's work and a man's wife are both needing him, it is the wife who must wait. *Always* with a conscientious chief his work comes first—day or night. There is no hour in all the twenty-four that is "out of hours" for a chief.

A fault on the mains puts half the town in darkness one night. . . . In the grey dawn he locates the fault, gets things going again and hurries home—with his heart in his throat. He finds his son born, and his wife nearly dead. . . . They are alone in the darkness. . . . In a station engineer's life, it is curious how trouble at home always synchronises with "trouble on the mains," "trouble at the station," "breakdown of No. 3," or, at mildest a boiler inspection.

At the end of the fifth year they have the good fortune to secure a charming little villa, with a nice bit of ground attached, and proceed to make a real home of it, always reminding each other, however, that even this must be sacrificed should another stepping-stone appear. They turf the lawn, fix up a summer-house, plant fruit trees, train creepers and rambler roses round windows and porches, build a poultry house, put shelves in the kitchen, and paper several of the rooms, and—the stepping-stone appears.

To Ruth, it does not appear a very attractive stepping-stone—no more roomy than the one they already stand on. But that is a woman's way of looking at things. There is a steam turbine in the new station, and he has never had a turbine to play with! Against a new engine, what woman can stand? The turbine wins the day. . . .

Ruth weeps in secret, and smilingly congratulates her clever husband.

The new station is a long day's journey away—let us say, in Lancashire. He wants to leave her behind until he has found a house, but fearing the vagueness of that prospect, and dreading the journey alone with two babies, she again declares "Where thou goest I go." The miseries of that journey can easily be sketched in by anyone who has travelled a whole day with little children, and arrived at midnight in a strange town. Hotels are promptly closed against them on account of the children. . . . There are *queer* places where one can "lodge" apart from hotels. . . . The babies develop measles and are taken to the hospital, where the youngest nearly dies.

Ruth goes house hunting again, and hears, with indignation, her offspring termed "encumbrances." Once more she takes the town's leavings in house property. When they are settled, she again visits her people, after a painful spasm of economy, for the removal has robbed them of a year's savings. She takes the children, and wears last year's clothes, *of course*. Her sister, who has married an engineer who is *not* a rolling stone, but is content to remain, as his catechism bids him, "in that station of life," &c., &c., has had a model villa built to her own design, with every labour-saving device that the heart of woman can crave for, and looks forward to being Mayoress next year.

When Ruth meets the wives of the men-she-might-have-married (and didn't) it is inevitable that she should mentally compare their lives with her own. They all look comfortable and prosperous. She hears them discussing plans for the future, plans for the extension of their premises, the beautifying of their houses, the gradual building up of a comfortable home. She listens in dull silence. For her these joys are not. Hers but to sit on her boxes till Fate orders her to "move on." It is not the luxury and ease of their lives she envies. It is their restfulness, their regularity. She is tired of adventure. She longs, as she never dreamed she would ever long, for the hum-drum, *rooted* life—for a real *home*.

The "move on" order comes just when the elder boy has a hard-won scholarship within his grasp, and the eldest girl, after months of waiting, has been admitted to the high school and bought several pounds' worth of text books. The children are old enough now to protest against the periodical uprooting, and "Ruth" has the double task of reconciling them and herself. She herself has just begun to feel at home in the place; has found interests and friends; has become something of a social worker. She has trained a raw girl to a state of surprising proficiency as "general," and is at last able to take life a little more easily.

But the demands of the Career are more inexorable than ever. . . . For soon it will be too late.

In the new place there is no house at all for them, though the committee had assured them that "that would be all right." When she sees some of the houses the committee had had in their minds for them, Ruth is filled with blind wrath. What sort of men, she wonders, do these people imagine electrial engineers to be? And what sort of wives do they expect them to have? And how do they think an engineer's children are brought up? Do they really propose that he and they should have a bath once a week—in the kitchen? How is it that electric supply companies are so very much behind their natural enemies the gas companies, in their treatment of their officials, especially in the matter of housing? Why, she demands, indignantly, has not every central station got a manager's residence attached, or at a convenient distance?

They have to take a furnished house. It has no bathroom, no hot water, no pretence of "labour-saving" anywhere. But it *has* an underground kitchen, and lots of nice, steep stairs. . . . There are no servants in that land, and the charwoman is extinct. . . . The boys will have to travel ten miles to school every day, and the little girl must be sent to boarding school.

Their furniture, or the wrecks of it, they manage to get stored in a disused warehouse. When the china is unpacked it is found in a thousand pieces. The old oak coffer—a family heirloom—has a panel broken; the grandfather clock has its face cracked; the piano is hopelessly ruined, outside and in, there is a large splinter sliced off the sideboard. . . .

As she stands in the old shed, with the rain dripping through the cracks in the roof, among the ruins of her home, Ruth suddenly feels very, very tired, and realises with a gasp that *she is middle-aged*, and the loneliest woman on earth—that she is still, and to the end of the chapter, a stranger in a strange land, with no interest in the town she lives in, no stake in it, apart from her husband's business, and that she is—*homeless*!

And that evening, sitting in some other woman's ugly, uncomfortable room she asks, "Did you see that advertisement in the Review, John?" And he says, "No good! Must be under forty!" And she looks up and notices with a pang how grey his hair is on the temples, and how thin on the top. And she picks up the evening paper and sees the "New Scale of Salaries for Teachers," and notes with interest that had she remained in her old profession, her salary to-day would have been just a trifle higher than John's.

THE ATTITUDE OF THE EMPLOYER TO THE STAFF ENGINEER, AND ITS EFFECT ON LABOUR.

By A. JACKS.

It is deplored on every hand that the amicable relations which ought to exist between employer and workman are far from being attained, and it is often objected that in most cases Labour meets Capital with a deep-rooted and immovable suspicion. Whilst it is true that much of this suspicion is due to events which happened years ago, events over which the present generation of employers has no control, and for which it is in no wise responsible, yet it has to be admitted that from time to time cases crop up which compel one to acknowledge that the workman has some reason for his deep distrust in some quarters.

Now, as long as there is any possibility of the leaders of the working man pointing out such regrettable matters, so long will there be ample fire to permit the more extreme leaders to raise all the smoke they require for the purposes of misleading the men, and of urging them to fight and distrust capital and to seek to supersede it in the control of industry, rather than agree to work hand in hand for the benefit of the whole trade from top to bottom, and incidentally for the well-being of the nation.

One fact which gives the ultra-socialist leader an opportunity to do damage is the manner in which the staffs of engineering and other industrial undertakings have been treated by the employers, especially during the last five years.

Again and again has it been rubbed into the staff engineer that though he may have a good case for consideration, unless he has at his back a powerful trade union, call it by what other name he may, he will assuredly get no consideration whatever in quite 98 per cent. of the engineering undertakings of this country. Time after time, the men have come forward with large demands, threatened trouble, and been placated with at least a very considerable share of what they demanded. This, in turn, has increased the cost of living, and yet, although this was acknowledged quite freely by Capital, and though the men were in many cases earning more than responsible members of the staff, it is no exaggeration to say that almost the only time the staff man was listened to was when he had proved his worth to other people, and had been offered a better berth elsewhere. With the introduction of the Act which put a stop to staff engineers or men changing their employer at will, the case of the staff man became intolerable, and forced him to form an association run on semi-trade union lines, with trade union powers and registration.

Now the very existence of such unions, and the fact that in many cases injustice has only been removed when the use of the strike weapon has been appealed to, means that the employer as a class has been guilty of bad faith, and bad treatment of his staff men; and has not altered his tactics until he has been absolutely forced to do so.

This treatment of the staff has not passed unnoticed by the leaders of the men, and it is mere ostrich-like folly to imagine for one moment that the men's leaders do not know of the trouble and difficulty which the staff men have encountered in forcing a modicum of justice.

Such a man, say a leader with somewhat extreme views, and perhaps a feeling of bitter antagonism to Capital in any form, simply points out to his members that if the employer will treat his lieutenants, who virtually make it possible for him to organise and run his business at a profit, in so shabby a manner, how will he treat his workmen if they are unorganised, or so misguided as to trust their employer?

Let us for one moment consider the position of the staff man. Whether in manufacturing, selling, or power station work, he must be a well trained man, capable of using his brains, and of either organising men or schemes, or both, so that harmonious progress right through the whole works is the rule, and work is turned out well, expeditiously, and at a good profit on a competitive market.

He must reconcile the interest of the employer and workmen on the one hand, always bearing in mind that as the representative of the employer he must see that everyone under him gives full value for the wages or salary he receives; and on the other hand, he arranges that whilst the interest of the customer is kept well in view and catered for, that this humouring does not land his employer into the region of low, or no, profits.

Thus, in every way, it is to the employer's interest to treat his staff men well, and to make them comfortable.

It might be argued that the very fact that the staff men are so valuable to the employer, would make it imperative that the staff man be treated and remunerated properly. On paper, this is all right; but in practice, the fact that there are so many really good staff men on the market has enabled the employer to take an unfair advantage, and to play one man, or set of men, off against another. This has been the rule rather than the exception, and once again this fact has been known to and utilised by the men's leaders. "Look at what he does for his draughtsmen and other assistants, look how he treats them, and underpays them, and then recollect that if you leave the shelter of your union and trust to his promises, you will be treated the same." The above, or something equivalent, has been used time after time to keep alive the men's distrust; and so long as so many examples are available, examples actually known to each man who is a member of the union, so long will that distrust be kept in being, and the longer it lives, the harder will it be to kill it.

When an agitator can point out to his members that an employer treats shabbily his own officers, then that agitator is going to be listened to.

Again, it might be said that the staff man had his remedy, he could leave the undesirable firm and go to another. There are several flaws in this argument, the chief being that for one firm which did give its officials really good and fair treatment, there were at least 50 which did not, and would not, until compelled, by a staff union. Again, the staff man is not in the same case as the workman. The workman can, if discharged from one shop, get another berth at the same rate of wages, and with the same trade and social standing as at the works he has left. Not so the staff man.

The staff man's natural progress is to more and more responsible positions, as the years go by, and his experience widens. At the end of ten years' hard work he might find himself, before the war, making a paltry £200 a year, or even less, and with the knowledge that if he left or lost that berth through asking for fairer conditions, he would probably have to take up a much less well-paid situation, and be thankful to get in somewhere and make some sort of a living, whilst experiencing a big drop in salary and position.

This fact was undoubtedly played on, and still is played on by the majority of employers, who know that a man will put up with a good deal before he throws away the fruits of ten years' hard work—for someone else's benefit.

Here again, the fact is noted in the labour camp and the word put round: "Don't let them have too many apprentices, or you see what you will get." Is it any wonder that the distrust does not vanish more quickly, or that it fails to vanish and simply deepens?

In more than one staff office or drawing office it has been the rule to frown on men who applied for other jobs; and every staff man knows how necessary it is in the majority of cases to keep his present employer in ignorance of the fact that he is after something else. Within the last few weeks two different men have spoken to the writer on this matter. One, an employer talking about men leaving him, declared to the writer that as soon as he knew that one of his staff was looking out for another job, he sacked him; and that he wasn't going to have men in and out of his offices every 18 months. He was asked if he gave them any inducement to stay, and replied that he gave them what he thought fit and no more; when told that in his attempt to nail his staff men down to a mere 50s. or 70s. a week he was not only guilty of a considerable immorality, but was acting as a cad, his rage was worth witnessing. And of such is the kingdom of capital.

The other man, who was as much a gentleman as the first was a cad, offered the writer a fairly good berth, and actually asked, "If we go further with the matter, will it prejudice your present berth if I write to your firm?"

The fact that such a question was necessary, and that such precautions are necessary more often than not, is a stain on the good name of capital.

Look at it how one will, as long as this spirit prevails, so long does it prove that capital will permit its general managers to twist the last ounce of work out of an unprotected class, for the least amount of pay; and so long will there be labour trouble.

Whether he knows it or not, the employer has taught his men, and at last his staff, that unorganised and unprofected, they will get nothing from him. When does he propose to alter his tactics, and when will he cease expecting to reap harmony and goodwill when he has consistently and persistently sown suspicion?

New Sources of Aluminium in Norway.—Metallic aluminium can be obtained by electrolytic methods from its oxide; the oxide, however, must be free from iron and silica. The ore most commonly used is bauxite, after it has been purified by the costly Baeyer process. There being no bauxite in Norway, Prof. V. M. Goldschmidt, of the Mineralogical Institute, Christiania, in 1917, conceived the idea of using Labrador stone as a source of aluminium. By Goldschmidt's process, the Labrador stone is extracted from the plagioclase felspar, by means of 30 per cent. nitric acid (the first raw product of the electrical air industry). The silica and the greater portion of the iron minerals remain insoluble, while aluminium, calcium, and sodium go into solution, together with a little iron. After removal of this iron the solution is evaporated down to dryness, and the residue heated to a certain temperature at which the aluminium salt alone is decomposed, the nitric acid driven off being collected as a valuable concentrate. By washing with water the nitrates of calcium and sodium are removed, to be recovered and used in agriculture, whilst the alumina remains.

Since there are abundant supplies of the white, marble-like rock or plagioclase felspar, containing about 30 per cent. alumina, in South-West Norway, this process seems full of promise for that country.—*Nature*.

AN AUTOMATIC CURRENT-LIMITING REGULATOR FOR ALTERNATING CURRENTS.

Messrs. W. L. Davies and A. Soames have patented an automatic alternating-current limiter in two forms:—

(1) As a transformer in which the primary can be wound for any main voltage, the secondary being wound to give the required working volts, and in which (as described below) current can be taken from the secondary up to any predetermined amount, within the capacity of the winding; when this predetermined amount is reached the current remains constant and the pressure decreases to zero at short circuit.

(2) As a choke coil which may be connected in series with the work and which in its normal position does not introduce any appreciable choke or resistance into the circuit, but which, after the current reaches a predetermined value, begins to introduce choke and keeps the current constant at that value down to the load becoming a complete short circuit.

The general construction of the transformer is shown in fig. 1, where B is a stator wound with coils A A; these coils are in practice wound in semi-closed slots and distributed as in an A.C. motor stator. B_1 is a rotor wound with coils C C, on the shaft of which is fixed an arm E, upon which slides a weight E^1. This arm and weight are tilted very slightly from the vertical by a stop F. Assuming that the stator winding is used as the primary and is connected to the mains, and the rotor is used as the secondary and connected to the working circuit, the action is as follows:—

The voltage induced at the terminals of the secondary = $a \cos \theta$. As θ increases the pressure decreases. If current is taken from the secondary the apparatus acts as an ordinary static transformer until a certain current value is reached, this value depends on the weight E_1, and its distance from the centre. After this point, if the resistance of the circuit is decreased still further, the arm and weight begin to rise, *i.e.*, the angle θ increases, the current remains perfectly constant and the pressure decreases; this can be continued to dead short circuit, when the terminal pressure will have fallen to zero, while the current remains perfectly constant.

The values to which the current is to be limited are fixed by sliding the weight up or down the arm, which is graduated in amperes. This is the only adjustment, and can be easily set with extreme accuracy, and there is nothing whatever to wear or alter.

The choking coil is another arrangement for producing a similar current-limiting effect, and when it is in circuit, but not in operation, there is no loss, such as the open-circuit loss of a transformer; it is therefore particularly suitable for use in work where the current is only used during part of the day, but the regulator must be left permanently connected. The apparatus is constructed in exactly the same way as the transformer, but since (unlike the transformer, which transforms the whole load) it is only required to choke down the excess load, it may often be smaller.

The coils on the stator and the rotor are of exactly the same number of turns, and are connected in series with one another. If the stator and rotor coils are co-axial and the current in the stator is in the opposite direction to the current in the rotor, *i.e.*, the coils are in opposition to one another, it is obvious that no magnetism is set up, and there is no choke and no core loss. As the rotor is revolved through 180 deg. the coils come into conjunction with one another, and the choke introduced by the apparatus increases from zero at no degrees to a maximum at 180 deg.

The rotor is provided with an arm and sliding weight similar to that of the transformer; the arm is very slightly tilted from the vertical, introducing a very small choke, but this is so small as to be negligible.

When the apparatus is connected in series with any load it remains inoperative until a predetermined current is reached, this value being, as in the case of the transformer, determined by the position of the weight on the arm; after this value is reached the rotor turns automatically and keeps the current constant by choking the circuit, thus lowering the voltage across the load.

The outstanding features of these methods of regulation are:—

1. The working circuit is in no way affected until the predetermined current value is reached.
2. The regulation is perfectly continuous and gradual.
3. The only adjustment necessary, viz. the weight, could not well be more simple.
4. As there are no revolving parts, machines can be built cheaper and as efficient as, if not more efficient than, a well-designed induction motor.
5. The regulating action does not consume or waste any power.

In applying these machines as overload preventers the choice depends on the nature of the regulation required; the transformer is capable of reducing the pressure to zero, and would, therefore, be used where a short circuit was to be allowed for, but if it were only desired to reduce an overload to a certain amount, a choke coil big enough to handle the overload, but smaller than a transformer, which has to handle the whole load, could be used.

Thus, in the case of a factory using, say, 500 H.P. divided up into a large number of motors, excessive current is apt to be taken when beginning work for the day or after meals. If the main fuses are sufficiently large to pass this extra current, their protective value is reduced, and the general distribution is apt to be disturbed; if the fuses are smaller, they are likely to be blown, causing much delay.

In such a case as this, if an automatic limiting choke coil is put in series with either the primary or the secondary of the supply transformer and permanently adjusted to operate at a given current limit; any attempt to exceed this current will result in the pressure being lowered, but the maximum allowable current will remain: the start-up will be slower, the pressure rising as the motors get up speed, and no delay or disturbance to other parts of the system is caused. The choke coil can be sealed up so that it cannot be tampered with, and under normal working conditions it does not introduce any appreciable choke, resistance, or loss into the circuit.

Either a transformer or a choke coil may be used as an individual motor starter in place of the "Auto transformers" at present used, but in this case instead of the pressure being increased in jumps, it automatically rises in a constant gradation as the motor gathers speed; a still greater advantage may be obtained by arranging the starting switch to first pull up the weighted arm to its position of least, or (in the case of a transformer) zero pressure, then switch on the motor and drop the arm (provided with a dash pot) which will sink down to a position giving the motor only the predetermined current, which current is then maintained by the arm sinking lower and the pressure rising exactly as the motor gathers speed. In this case there would not be even a momentary jump in starting up the motor.

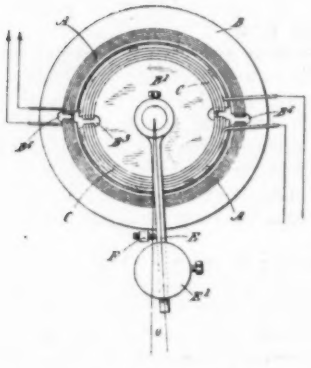


Fig. 1.—Automatic A.C. Limiter, Transformer Type.

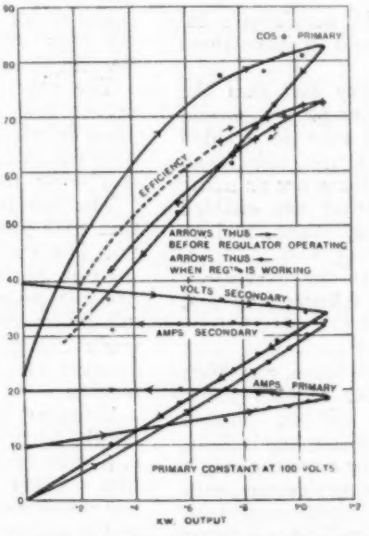


Fig. 2.—Characteristics of Automatic Regulator.

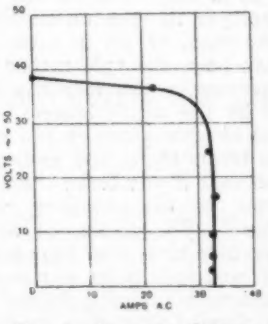


Fig. 3.—Showing Control of the Current.

In spot-welding, the use of a limiting transformer or the employment of a limiting choke coil enables the exact current to be set without any taps or voltage adjustments; the transformer sets itself for the right voltage to give the desired current. This also applies to electric furnaces.

The transformer is especially applicable to electric arc welding. This process offers about the worst case calling for current regulation that can be found in practice, the working circuit varying rapidly and continually from open circuit to short circuit, and when the electrode welds on to the work, which constantly happens, a very thorough short circuit indeed is produced.

There are also one or two conditions it is important to fulfil, viz., the arc must be short, a long arc producing a bad weld; and it must be easily struck, *i.e.*, there must be sufficient current flowing when the electrode is in partial contact with the work to volatilise a small portion of the metal and start the arc; to obtain this end it is at present customary to use a higher open-circuit voltage in conjunction with magnetic leakage-gap transformers, or series choke coils; this enables the operator to draw a long thin arc, producing a bad weld, and as it is easier to operate with a long arc than a short one, it is very liable to be done.

The open-circuit volts in general practice at present range from 75 to 110, whereas the welding volts, viz., across the arc when formed, are from 18 to 25 volts.

With a current-limiting transformer there is no choke or resistance in the working circuit, and the full pressure is across the arc space until the regulator moves; owing to the small inertia of the moving parts, for the fraction of a second there is a sharp rise of current which starts the arc, and the regulator immediately falls back; a large open-circuit voltage is not required, and it can therefore be made impossible for the operator to draw a long arc.

The operation of welding with this transformer becomes an extremely simple one; there are no taps, and there is no voltage regulation to consider. Provided the secondary pressure is enough to give the maximum current, at the proper length of arc when using the largest electrode that the transformer is intended to use, it is only necessary to shift the weight for lesser values of current and smaller electrodes; the transformer takes care of the pressure and adjusts it to give the desired current automatically.

Fig. 2 shows the characteristics of a small machine—a converted induction motor: a machine specially designed for the purpose would, of course, give still better results. Fig. 3, which is plotted from the same data, shows in a more striking way the effective control of the current; as the external resistance is decreased the current increases up to about 32 amperes, at which value it remains constant while the resistance is reduced to zero. We recently witnessed a demonstration of the working of the device, which fully bore out the claims of the inventors. It has been pointed out, in discussions on arc welding, that the personal element is the ruling factor in the efficiency of the process; if means can be found to ensure that the welder does the work properly, there will be no question as to the reliability of the joint. The first requirement in this direction is to compel the welder to use a short arc, and as the automatic device enables the minimum voltage to be used, it ensures that when the arc is drawn out too long it shall be extinguished; at the same time a considerable saving in energy is effected in comparison with the use of a buffer resistance in series with the arc, and the simplicity of the apparatus reduces the capital outlay on a welding outfit—a serious matter when several hundred welders, each requiring a separate equipment, are at work in a shipyard. The combination of the transformer and regulator in one small machine also meets two other requirements—namely, portability and economy of distribution of power at a reasonably high pressure.

THE INSTITUTION OF ELECTRICAL ENGINEERS.

South Midland Centre.

On November 5th a "reunion dinner" was held at the Grand Hotel, Birmingham. There was a large attendance, about double that recorded at the last annual dinner (pre-war); the chairman of the Centre, Mr. S. T. Allen, presided, and amongst those present were Mr. Roger T. Smith, President I.E.E., Mr. C. H. Wordingham, C.B.E., past-president, Mr. W. B. Woodhouse, Dr. G. Kapp, Mr. P. F. Rowell, Mr. F. Lantsberry, Mr. W. H. Varnon, Dr. C. C. Garrard, Mr. J. B. Burman, Mr. E. E. Bissell, Mr. J. H. Barker, Mr. G. W. Carrington, Mr. H. C. Field, Mr. F. Forrest, and Mr. J. D. Morgan, hon. secretary.

After the toast of "The King," the chairman said that the first object of the meeting was to welcome back those of their members who had been serving with the Forces during the war; to those who would never return he paid a solemn tribute. Referring to the increased activity of the Institution, he remarked that the Council and the members were in closer relationship than ever before, and they had great confidence in their executive. He welcomed Mr. Smith and Mr. Wordingham, and expressed the indebtedness of the South Midland Centre to the hon. secretary, Mr. J. D. Morgan, whose work had been of the utmost value to the Centre. Mr. Allen then inducted his successor, Dr. C. C. Garrard, to the chair.

Dr. Garrard said that the work of the Centre had been carried on under difficulties during the past five—and especially the last two—years, and bore testimony to the successful efforts of Mr. Allen and the work of Mr. Morgan.

Prof. Sir W. Ashley, Vice-Principal of the University of Birmingham, proposed "The Institution of Electrical Engineers coupled with those members who had served in His Majesty's Forces during the war," pointing out that out of 7,000 members no fewer than 2,000 had joined the Colours, whilst many others had given valuable scientific assistance to the Government; to the 156 members who had laid down their lives, the guests, at his invitation, offered reverent homage by standing in silence. Sir William pointed out that this was the age of association and combination; greater standardisation, to lessen the cost of production, was vital to the future of the engineering industries, and in this respect the Institution was doing good work, but it had still more important functions—that of assisting manufacturers in improving their organisation, and raising the standards of commercial and managerial ability; and that of providing and maintaining a constant impulse towards the conquest of new fields.

Mr. Roger T. Smith, in responding, referred to the transitional conditions in which both the railways and the electrical industry found themselves in view of the establishment of the Ministry of Transport and the Electricity Supply Bill; there were many difficulties in prospect, but difficulties were made to be overcome, and he relied on the help of his colleagues in facing them. After describing an amusing dream, or nightmare, in which it appeared that all the railways were to be worked by gas, he referred to the epidemic of destructive criticism which had broken out, and to the suggestions of the lay Press that the country was going bankrupt, and emphatically denied the allegation; in spite of all its troubles, he believed this country had now the opportunity of recreating a great deal of the wealth that had been destroyed by the war, and was never in a better position to do so. They had come into a great inheritance—he hoped they and the country would reap the benefit of it.

Proposing the toast of "Kindred Societies and Guests," Mr. W. B. Woodhouse said that there was no service in which electricity was not used; before the war it was a young and pioneering industry—the war had emphasised the value of co-operation, and they now fully realised the great advantages to be derived from close collaboration with other engineering societies. The Territorial Centres were taking a larger part in affairs than formerly, particularly in connection with technical education. Mr. H. C. Field, president of the Birmingham Chamber of Commerce, responded, pointing out the necessity of association between societies as well as between individuals, and urging that labour troubles could be overcome by the capitalist being larger-hearted and the worker broader-minded.

Mr. C. H. Wordingham, proposing "The Electrical Industry," said that the prime essentials to successful manufacture were mass production and standardisation; not only the big companies could engage in mass production; small firms could do it also. There was a tendency to lay too much stress on gigantic undertakings—there was still room for small concerns and scope for individual effort. With regard to standardisation, his experience did not bear out the view that the scientific engineer could impose his views on the manufacturer—the latter would have his own way; but he had noticed a certain narrowness of view with respect to standardisation. Even the "Beama" met with difficulties; one or two men might stand out for their own methods, and spoil the whole scheme. He urged that manufacturers should take a very broad view of the matter, and be prepared to make concessions. There was now a magnificent opportunity for gaining foreign trade, but there was a tendency for manufacturers to fill their books with home orders and to neglect export trade; they should set aside a proportion of their output for export as seed for a future harvest. Defining the "load factor" as the ratio of a man's actual output to his possible output, Mr. Wordingham said they should aim at making it as high as possible, lest the diversity factor should come into operation, with disastrous results to the workman. The electricity supply industry had been taken in hand by politicians, and if they forced the pace unduly the results might be disastrous to the industry. Many problems were not yet fully solved. For example, they did not know the best way to deal with fuel to get the maximum output; a power station site chosen for the sake of a good supply of water for condensing might be very undesirable in other respects—if the station were combined with a carbonising works, the extreme economy of fuel might become of less importance, and the choice of site would be materially affected. American experience with very large turbo-generators had not been very encouraging, and much investigation was necessary to ensure reliable results. Similarly 30,000-volt cables were hardly ripe as yet, and they must beware of the efforts of non-technical men to force the pace. The Edinburgh contract was a most serious matter; if the order went to Switzerland it would be a blow to the British electrical industry. If the Government dictated the wages to be paid by British firms, it should also dictate to purchasers where to buy

their plant—it was not fair to impose conditions on British manufacturers which were not imposed on foreign firms, or to allow a municipality to save the pockets of its ratepayers at the cost of the taxpayer, who would have to provide the unemployment doles.

Mr. F. Forrest, responding, said he was recently in the works of the Swiss firm, and was not altogether surprised that it secured the contract. This country must wake up; during the war the electrical industry gave a wonderful demonstration of its adaptability and elasticity—1¼ million kw. of new plant had been installed in public supply stations—and it had a bright future. Electricity was the handmaiden of every other industry, and with common sense and mutual forbearance master and man should pull together with a will to place this country in the forefront of the manufacturing countries of the world.

Mr. W. E. Warrilow proposed the health of the chairmen, to which Mr. Allen and Dr. Garrard briefly replied. A "social reunion" then took place, following the excellent procedure of the London dinners of the I.E.E. During the dinner a programme of music was performed, and afterwards Mr. W. E. Warrilow told stories, some of which were new. The function was very enjoyable and successful, and, as Dr. Garrard observed, it made a landmark in the history of the South Midland Centre.

Western Centre.

At the first meeting of this Centre for the session 1919-20, held at the South Wales Institute of Engineers, Cardiff, on November 3rd, Mr. Arthur Ellis, chairman, delivered his inaugural address, of which the following is an abstract:—

In regard to the period prior to the war, whilst it will be readily admitted that the electrical industry—involving the production and distribution of electrical energy generally—has made a certain amount of progress, such progress has not been such as one would have desired, owing, more particularly I suggest, to lack of interest on the part of those in authority, in the various Government Departments relating to same, and it was not until some time after the outbreak of war that we realised that the resources of this country had not been developed to the extent that they should have been and as was necessary for the proper prosecution of the war.

Electricity (Supply) Bill.

This brings me to the introduction of the Electricity (Supply) Bill in Parliament by the Government. A paper was read before the Institution, by Mr. E. T. Williams, in 1916,* and knowing what we know to-day, one is almost inclined to think that his paper was inspired by the Government itself, as if not, then it represents a very wonderful anticipation to a very great extent, of what the Government actually intends should be done, and if the latter is a correct assumption, then Mr. Williams has undoubtedly done a great and lasting service to the country. As referred to in the discussion on the paper by Mr. Charles Merz, some credit is due to Dr. Ferranti, who strongly advocated something of a similar character, and to my mind it is regrettable that we should have waited so many years to have been taught what the great war has taught us before the Government has really taken the matter into consideration. Had it been otherwise, I have reason to think that the war would not have lasted as long as it did. I still hold, as I have always held, that had it not been for the many restrictions imposed by Government departments and others upon the operations of electricity undertakings, such a Bill as that now being promoted in Parliament might never have become necessary. The powers conferred by the Bill upon the Commissioners, if carried into effect in the right spirit, will be of undoubted advantage to the whole community, affecting, as it is intended to do, the cost of production and the extended use of supplies for every conceivable purpose. I would favour the formation of a District Board at the outset, comprising the technical representatives of the various undertakings in an area, and so long as they enter into the business with an entirely open mind, without any prejudice relating to their particular undertaking or any other, I feel satisfied that only good work would ensue, and a board constituted in this way would be of undoubted advantage to the Central Board of Commissioners in London. I would at no time include the direct municipal representatives, as they, to an extent, must be controlled by local sentiment.

A particularly good feature in the Bill is that relating to wayleaves, which will affect most undertakings, and particularly so that with which I have been connected during the past 19½ years, but which I am about to leave in order to join that branch of the profession which our immediate past chairman in his address to you last year considered was a fast disappearing one. I, however, hold somewhat different views.

The undertakings of which I have had control during so many years, as well as the City of Cardiff as a whole, has suffered very considerably in past years from the effects of wayleaves Practically the whole of the industries of Cardiff are situated upon what is the private property of the Cardiff Railway Co. and the Marquis of Bute, known as the Bute Docks Estate. To-day there is no general supply of electricity available upon this property, a facility which is very much needed if such industries are to develop as one would wish, effecting as it would do not only considerable economies in the cost of working generally, but also—and what is of still greater importance—the development of the business of the docks and the immediate districts surrounding it. The authorities controlling as owners have not afforded such supply themselves, notwithstanding the fact that they would derive a direct benefit from it, nor will they permit the local authority to undertake the work (which all along it has been willing and anxious to do) except under restrictions such as would render successful administration practically impossible. From this point of view, if from none other, the Bill will be welcomed, as such wayleaves as are now necessary will come under the direct control of the Board of Commissioners.

Then another good feature of the Bill is that relating to existing areas, which in the past have suffered as a result of being too restricted, not only in regard to lighting and power supplies, but also—and what is of equal importance—transport facilities.

A particular district must not be denied a supply simply because the source of supply controlling that district is far remote whilst some other source might be available at the boundary. It may take years to get everything properly arranged, and yet something must be done in the meantime to supply the increasing demands, and perhaps some form of linking-up of groups of stations, not far remote one from the other, would be easy of arrangement, pending the development of the larger scheme, and in connection with which there is another matter of considerable importance, viz., the attitude of the individual who would desire to take a public supply and yet in the meantime has necessarily to install his own plant.

During the war everybody requiring plant and machinery had to obtain a permit from the Ministry of Munitions. If, therefore, the Board of Commissioners could continue this principle of control during the development of the larger scheme, it would be able to ensure that all private installations would be capable of being coupled up to the general scheme of supply without any substantial alterations being necessary. Frequencies, voltages and systems of supply in different areas ought to be settled without delay, so that prospective consumers will know what to provide for. In certain areas the whole difficulty might be solved in this way, especially in those areas where there is no appreciable amount of waste-heat gases available. Rightly or wrongly, I am of opinion that the policy of having too many eggs in one basket is a dangerous one, and I see a lurking danger in having the whole of the electrical supplies controlled from a too limited number of super-power stations. The possible attitude of labour in the future must be taken into account. The fact that the Electricity (Supply) Bill will make it a penal offence for employés of electricity supply undertakings to cause interruptions to supply by striking under certain conditions would not have much weight with some of the more extreme leaders of labour.

Also we must not overlook the possibilities of interruptions of supply to large areas through breakdowns of large units or in the overhead transmission lines.

Another feature which requires some clearer definition is the clauses relating to charges for bulk supplies, notwithstanding that it is laid down that those whose stations might be taken over shall not pay higher rates than those at which they were able to generate themselves. Due allowance ought to be made in the case of stations, the owners of which have been waiting for the termination of the war to carry into effect alterations and extensions of plant, also the scrapping of plant which, during the period of the war, has become obsolete, in order to further reduce their costs of production, all of which might be done without any appreciable expenditure of capital moneys. Regarding the operations of municipal authorities in the development of the electrical industry during past years, which have been considered to have been disastrous, in my opinion that amount of credit which is due to them has not been given. I cannot conceive in what way their operations have been disastrous.

Many municipal undertakings would have willingly extended beyond their areas if they had been allowed to do so, but Government departments have been too apt to listen to the pleadings of smaller urban and rural councils, whose opposition has merely emanated through jealousy, than they have to the pleadings of the larger authorities. This is substantiated by what the Government now proposes to do as a result of the Bill. There may have been some cases where the activities of certain authorities have not been such as one would desire, but I think the interesting paper prepared by Mr. Arnold B. Cridley, the Director of Electric Power Supply, in conjunction with Mr. A. H. Human, is, in my opinion, a splendid testimonial to what municipal authorities have done and the results that have been obtained.*

I am of opinion that prior to the war, under the restrictions at that time prevailing, such developments would not have been possible. A fair comparison between company and municipal undertakings was not made when evidence was submitted to the various committees set up by the Government to inquire into this important matter, and the conditions relating thereto are very different in the two cases.

However, the Bill, if carried into effect in the proper way,

* Elec. Rev., April 21st, May 19th and 26th, 1916.

* Elec. Rev., August 22nd and November 7th, 1919.

should be of considerable advantage to all. One matter which appears to be perfectly clear, is the impossibility of standardising one frequency; it may be necessary to merely standardise in different areas. We shall always be satisfied if due and proper facilities are afforded for thoroughly developing the electrical industry in every way, bringing it within easy reach of the working people of this country.

Ways and Communications Act.

The next matter of importance is that relating to transport. The setting up of a Ministry controlling transport generally, provided under the Ways and Communications Bill, is an important step, and, in my opinion, a step in the right direction; it is one the result of which will be looked forward to with considerable interest. Those interested in the electrical industry will have felt considerable relief when the control of power stations was withdrawn from the Ministry and left under the control of the Board of Trade. Transport directly affects the trade of the country, and it is essential that all forms of transport should be properly co-ordinated. Companies competing with local authorities will have to agree to work together for the good of the industry generally. The difficulties regarding interchange of running, where two systems of tramways adjoin one another, and the feeling of jealousy between one authority and another, whether municipal or company, which have been allowed to prevail in the past, will have to be removed. When powers were originally sought through a Bill in Parliament for the construction of tramways in the City of Cardiff, clauses in the Bill, in the way in which they were drawn, were restricted to the operation of tramways alone. The system as such has been developed to the greatest possible extent, bearing in mind the restricted area in which it operates, but we have arrived at that stage where considerable additional traffic could be catered for by means of the motor omnibus, working in conjunction with the system of tramways. Although able to defray the cost of the purchase of such omnibuses out of moneys put aside for this and other purposes, we are not allowed to do so, for the sole reason that such powers are not embodied in the Bill relating to the undertaking, and it is this form of red tapeism that has restricted the operations not only of transport but other undertakings of a similar character. I am looking forward to the time when these will all be removed, and when it will be only necessary to make out a good case to the Ministry controlling the industry to have such powers conferred without any restrictions whatsoever.

Regarding transport facilities, my paper before the Municipal Tramways Association's Conference in 1917 referred to the development of the tramway industry, and even at that time I had in mind something similar to what will, in my opinion, be likely to result from the Bill. I pointed out that upon the termination of the war great openings for tramways and transport undertakings generally would arise; I also suggested that the railways would later be used for the long-distance traffic, whilst tramways or light railways would cater for all the less important traffic. I suggested that canals and waterways would probably be taken over and converted to either electric or steam haulage in order to remove pressure upon the railways. During the war we have learnt the lesson of the advantages of the cultivation of food, and we have appreciated the difficulties of transporting food from where it is produced to the centres, from which it is either distributed or disposed of. All these difficulties have arisen as a result of restrictions previously imposed upon tramway undertakings, willing to cater for them but not allowed to do so. The development of tramways and other forms of transport will certainly be necessary in connection with housing schemes. The extension of tramways, light railways and other forms of transport will surely tend towards the development of extensive areas of land now lying dormant. I think we can reasonably look forward to seeing at some future date —I hope not far distant—towns and cities generally, both large and small, inter-connected in this way. The time must come when important tramway undertakings will have to be linked up by means of sidings, so that during many hours of the twenty-four when the transport of the ordinary passenger is not required the lines and equipment can be used for the transport of goods. All this will conserve coal supplies for more important purposes. In regard to the Bill, the electrification of railways is a very important feature, distinct entirely from what I have reason to think will take effect in course of time, viz., the construction of special transport roadways as main arteries throughout the country for the rapid transport of goods. Roughly speaking, there are some 24,000 miles of railways in the United Kingdom, and a very low estimate, based upon pre-war figures, would show that at even £20,000 per mile, the cost of electrification would not be less than some four hundred million sterling. Upon this basis it is not difficult to imagine what the present-day cost is likely to be. The railway capital at the moment is approximately 13 hundred million pounds sterling, and is not now productive of dividends; the addition probably of more than one half to this amount must necessarily be a very serious matter, but it is assumed that as a result of electrification considerable economies will be effected in operation which will counteract the increased capital expenditure to some extent. It will take some time to appreciate the enormity of the work involved in the electrification of our railway system throughout the country, but I have no doubt that that relating to suburban traffic will first of all be taken in hand, and the larger scheme gradually and carefully developed. If the railways, as we have reason to think, are to be eventually handed back to the companies previously controlling them, there may be some difficulty in raising the necessary additional capital, unless financial relief is afforded by the Government.

Trusts.

The report of the Committee set up by the Ministry of Reconstruction in February, 1918, to consider the probable extension of trade organisations and combinations and methods of safeguarding the public interest, indicates that there is a clear and increasing tendency towards combinations. Such combinations will no doubt have a very good effect if and so long as they are not abused. It is a case of elimination of competition. I am no believer in cut-throat competition. If, however, the formation of combinations or trusts could be restricted to the advancement of any particular industry, then of course it would be serving a very useful purpose, but if the consumer is to be exploited, it will be unfortunate.

Coal.

With regard to the Coal Commission set up by Parliament it is now felt by a great number that it would be a national calamity if the coal industry were nationalised. The attitude of labour generally in regard to the matter has been unreasonable, resulting in suffering by the community in general. The constitution of the Commission was not what any business man would recognise. One of the principal representatives of the men concerned, although a signatory to the Whitley Report, was directly leading a movement altogether antagonistic to the spirit of the whole scheme of industrial councils. Whilst the number of men employed is comparable with the number employed before the war, the output has dropped enormously—no doubt with deliberate intention. It is not a difficult matter to appreciate the effect that the price of coal has upon the cost of production, and the necessary increases in charges paid for supplies, and yet we talk about the development of the use of electricity generally throughout the country, whilst all the time such development is being made more difficult. The electrical industry almost exclusively depends upon ample and cheap supplies of coal. The price of coal, affecting as it does the electrical industry, affects also every other industry in turn. The restricted output has made it impossible to put in hand those works which are so necessary after the heavy dilapidations that have taken place during the period of the war. Is it altogether surprising, although it is regrettable, that in some cases we find orders being placed abroad?

Representatives of the miners have stated, very deliberately, that they could do as much in six hours as they previously did in eight or nine, but to-day they are not even doing in six hours as much as they did previously in three or four, and their attitude generally is jeopardising the whole of the industries of this country. Many of us feel that if left alone the greater number of the workers of this country would use better judgment. We can only hope that the formation of Industrial and District Councils will have the desired effect, but they will be no use whatsoever unless those controlled by them honestly abide by their findings. We cannot afford to lose time; already others have stepped into the field and are now reaping the advantage.

Research Work.

This is a matter which is deserving of the most serious consideration. A report submitted by a committee of the Privy Council, dealing with scientific and industrial research, clearly states that there is no closed door to research work. In the view of many, the persons who produce the results are the chief benefactors of the species. In some instances the exploitation of discoveries and inventions was deprecated, in the public interest, in past years, but those days are past.

One of the interesting features of the report is that relating to the formation of research associations. There was no time when the need for research work was greater than at present. We need more economical use of coal; the discovery of new sources of heat and power, better utilisation of national sources and waste products. There is the need of having our industries placed more generally upon a scientific basis, and we have need to produce and employ a much greater number of efficiently trained workers for both production and research. It is satisfactory to know that the Institution of Electrical Engineers is against any scheme placing research work and invention under State control, and it would be distinctly satisfactory if those engaged upon research work could make known their discoveries to all others, in order that they might have the advantage in some cases of some particular discovery that was of no commercial value to the individual discovering it.

Attention is drawn to the remuneration paid to men who are supposed to be highly skilled, possessed of University degrees, &c., to be responsible for the training of the minds of younger people, and to whom salaries of £150 per annum, rising to £240 by experience and qualifications, are offered. This salary was offered by a wealthy concern. I think you will agree that no salary can be too high for such an individual if the right one can be found, as it is impossible to

estimate his worth at its true value. It is extremely gratifying that these matters have been kept in a prominent position and taken into the serious consideration of the Institution, and in this particular connection our system of education, good as it is, must be improved and made to compare more than favourably with that of any other country, and facilities afforded to all, no matter in what station in life, so that the fullest advantage may be taken of it.

TECHNICAL STAFFS.

In conclusion, the salaries of technical staffs are a matter of the greatest importance. I am of opinion that local authorities and employers generally have not appreciated the members of their technical staffs at their true value, which has resulted in these people organising themselves in the same way as the ordinary employés have done, and instead of graciously granting the additional remuneration, more fairly representing the value of these people, they are now forcibly compelled to do so. This, to my mind, is a misfortune in more ways than one.

Personally, I welcomed the formation of the Electrical Power Engineers' Association, although it was most unfortunate that such a thing should have been necessary. It is in cases of trouble that we have to fall back upon our technical staffs; there are many instances where employés, dissatisfied with their conditions, have not hesitated to withdraw their labour, and the responsibility of keeping things going has been undertaken by the technical staff, and in such cases as these even their services have not received that amount of recognition which they have deserved. We have had some instances during the war, and since, of the value of the E.P.E.A., one of the most important of which was the power placed in the hands of public authorities for averting a strike on the part of the members of the E.T.U., who have, on more than one occasion, threatened to put London in darkness, and would have carried out this threat if it had not been counteracted by the representatives of the staffs remaining loyal to the community through the influence of their association.

NEW PATENTS APPLIED FOR, 1919.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEFTON-JONES, O'DELL AND STEPHENS (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

26,267. "Junction, &c., device for electrical wiring systems." E. WILCOX. October 27th.
26,278. "Electric device for starting internal-combustion engines." W. BYFORD and H. J. HARRIS. October 27th.
26,279. "Thermo-electric instrument." C. M. R. BALBI. October 27th.
26,326. "Electrolysing water." A. P. DE CONRADI. October 27th.
26,332. "Production of aluminium nitride, &c., by electrically generated heat." ARMOUR FERTILISER WORKS. October 27th. (United States, July 10th.)
26,333. "Electric heating apparatus." W. B. SMITS. October 27th. (Holland, May 5th.)
26,347. "Means for controlling transmission of electric impulses." W. R. SYKES INTERLOCKING SIGNAL CO. October 27th.
26,348. "Electric water heaters." W. F. CUTLER. October 27th.
26,350. "Controlling devices for electric starters for internal-combustion engines." F. J. GILL. October 27th.
26,352. "Turbo-electric driving arrangements." BRUSH ELECTRICAL ENGINEERING CO. and C. C. SUTTON. October 27th.
26,356. "High-frequency alternators." E. F. W. ALEXANDERSON and S. P. NIXDORFF. October 27th. (United States, December 6th, 1918.)
26,363. "Hand-operated rotary electrical switches." F. H. BREWERTON, F. A. FRASER and E. L. RANKIN. October 27th.
26,372. "Switch for filament-electric lamps." L. A. DE BECKER. October 27th.
26,374. "Transmitters for telephony." H. J. ROUND. October 27th.
26,415. "Electrical cut-out." W. H. ILLINGWORTH. October 28th.
26,416-7. "Sparking plugs." A. W. ARMSTRONG. October 28th.
26,420. "Maintaining lights of electric tramcars, &c., during changing over of trolley pole." L. H. DAVIES. October 28th.
26,421. "Sparking plugs." A. COX. October 28th.
26,433. "Holders for electric lamps." W. C. HANDS and ROBINSON & HANDS ELECTRIC CO. October 28th.
26,454. "Electrical conduit system." M. J. RAILING and T. TAYLOR. October 28th.
26,470. "Process for recovery of selenium and noble metals from electrolytic slimes, &c." M. CHIKASHIGE and D. UNO. October 28th. (Japan, October 28th, 1918.)
26,478. "Electric switches." E. G. HARCOURT. October 28th.
26,485. "Electrical installations for controlling electric pianos, &c." C. AUDRAN. October 28th. (France, July 18th.)
26,487. "Starting devices for electric motors." BRITISH THOMSON-HOUSTON CO. (General Electric Co.) October 28th.
26,488. "High-frequency alternators." E. F. W. ALEXANDERSON. October 28th. (United States, November 4th, 1918.)
26,493. "Magnetos, dynamos, electric motors, &c." F. J. S. JONES. October 28th.
26,495. "Electric-light fittings." H. A. J. H. MURREY and F. W. STANDISH. October 28th.
26,496. "Selective electric switch devices." ALLMANNA TELEPHONAKTIEBOLAGET L. M. ERICSSON. October 28th. (Sweden, December 11th, 1918.)
26,522. "Insulator bridge troughing for electric cables." E. G. SAMFORD. October 29th.
26,542. "Magnetic reflector." T. L. GALLOWAY. October 29th.
26,548. "Alternating current dynamos for lighting." A. E. GLANVILLE. October 29th.
26,572. "Thermostatic devices." W. FROST and H. FROST & CO. October 29th.
26,578. "Electrical devices." H. T. LAMBERT. October 29th.
26,596. "Multiple fuses for electric conductors carrying high voltage currents." O. CRACOANU. October 29th. (Germany, May 27th.)
26,611. "Electric meters." G. A. CHEETHAM and METROPOLITAN-VICKERS ELECTRICAL CO. October 29th.
26,612. "Electric heating." C. R. MATTHEWS and R. J. A. PEARSON and VICKERS, LTD. October 29th.
26,620. "Electric motors." F. ANGELL and H. B. ANGELL. October 29th.
26,621. "Installations for electrically lighting, heating and ventilating railway carriages, &c." H. D. ROHMAN. October 29th.
26,626. "Electric lighting arrangement for advertising, &c." J. SMEEKENS. October 29th. (Belgium, February 18th, 1916.)
26,634. "Electrically-operated pumps." MERRYWEATHER & SONS. October 30th.
26,663. "Electric furnaces." H. J. DEAN & REDMAYNE. October 30th.
26,672. "Sparking plugs." E. E. BATES and E. PERKINS. October 30th.
26,688. "Sparking plug." C. M. NEWTON. October 30th.
26,715. "Electric switching mechanism." WESTINGHOUSE ELECTRIC & MANUFACTURING CO. October 30th. (United States, October 30th, 1918.)
26,721. "Controllers for electric motors." BRITISH THOMSON-HOUSTON CO. (General Electric Co.) October 30th.
26,746. "Electric sparking plugs." ETABLISSEMENTS DE DION BOUTON SOC. ANON. October 30th. (France, December 12th, 1918.)
26,755. "Device for preventing tapping of engaged circuit in intercommunication telephone systems, &c." F. MEADE. October 31st.
26,767. "Switches for low-tension electric current." A. R. PARKER. October 31st.
26,776. "Electric control apparatus." J. WILSON. October 31st.
26,777. "Sparking plugs." J. JONES. October 31st.
26,791. "Sparking plugs." E. E. BATES and E. PERKINS. October 31st.
26,802. "Coin-freed prepayment devices for telephone systems." AUTOMATIC TELEPHONE MANUFACTURING CO. (Automatic Electric Co.) October 31st.
26,803. "Petrol-electric lighters." J. R. SHARP. October 31st.
26,807. "Sparking plugs." A. W. ARMSTRONG. October 31st.
26,815. "Electric motor starters and generator controllers." F. PLOWMAN and W. ROGERS. October 31st.
26,816. "Diaphragms for gramophones, telephones, &c." A. T. COLLIER. October 31st.
26,835. "Rheostats." J. W. BROWN. October 31st.
26,837. "Conductor arrangements for electric traction systems." C. E. FAIRBURN. October 31st.
26,859. "Electric contact makers for magnetos." F. MCLOUGHLIN. November 1st.
26,873. "Electrical distribution with alternating current systems." A. M. TAYLOR. November 1st.
26,887. "Dynamo-electric machine, motors, &c." H. C. BROWN and G. PEARSON. November 1st.

PUBLISHED SPECIFICATIONS.

The numbers in parenthesis are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1914.

8,118. ELECTROLYTIC METERS. Hatfield & Hookham. March 31st, 1914.

1917.

18,748. MACHINE SWITCHING TELEPHONE SYSTEMS. Western Electric Co. and L. Polinkowsky. (Western Electric Co. partly.) December 17th, 1917. (133,337.)

1918.

139. SEMI-AUTOMATIC TELEPHONE SYSTEMS. Western Electric Co., L. Polinkowsky and G. Deakin. January 2nd, 1918. (133,338.)
245. ELECTRICAL TRANSFORMERS FOR REGULATING OR VARYING THE VOLTAGE OF THE CURRENT SUPPLIED THEREFROM. F. E. Berry. January 4th, 1918. (133,339.)
704. MACHINE SWITCHING TELEPHONE SYSTEMS. Western Electric Co. and L. Polinkowsky. January 11th, 1918. (133,341.)
958. MACHINE SWITCHING TELEPHONE EXCHANGE SYSTEMS. Western Electric Co. and L. Polinkowsky. (Western Electric Co. partly.) January 17th, 1918. (133,342.)
1,493. MACHINE SWITCHING TELEPHONE SYSTEMS. Western Electric Co. and L. Polinkowsky. (Western Electric Co. partly.) January 25th, 1918. (133,343.)
10,131. ELECTRIC STEAM GENERATORS. F. Revel and A. Boldorini. June 19th, 1918. (133,361.)
10,526. METHOD OF AND APPARATUS FOR TELEPHONICALLY TRANSMITTING SPEECH IN AN IMPROVED MANNER. E. S. Pridham and P. L. Jensen. June 26th, 1918. (133,365.)
10,702. MODULATING MEANS FOR HIGH-FREQUENCY OSCILLATIONS. Western Electric Co. (Western Electric Co.) June 28th, 1918. (133,366.)
11,301. ELECTRICAL SEARCHLIGHT AND OTHER PROJECTORS. W. M. Mordey and G. A. Hughes. July 10th, 1918. (133,370.)
12,662. CARBONS FOR ELECTRIC ARC LAMPS. W. Heape and H. B. Grylls. August 2nd, 1918. (133,376.)
13,879. UTILISATION OF SOUND OR COMPRESSIONAL WAVES FOR SIGNALLING AND OTHER PURPOSES. W. J. Mellersh-Jackson. (Submarine Signal Co.) August 26th, 1918. (133,394.)
13,880. METHODS AND APPARATUS FOR SUBMARINE SIGNALLING. R. A. Fessenden. July 20th, 1917. (133,395.)
14,704. ELECTRIC RESISTANCES. T. W. Case. September 10th, 1918. (133,403.)
14,705. LIGHT REACTIVE ELECTRIC RESISTANCE ELEMENTS. T. W. Case. September 10th, 1918. (133,404.)
15,367. ELECTRICALLY-HEATED WARMING OR COOKING PLATES OF THE ENCLOSED TYPE. F. P. Fletcher. March 18th, 1919. (133,406.)
16,136. ELECTRIC VACUOUS BULB THERMIONIC DEVICES. J. Erskine-Murray. October 4th, 1918. (133,413.)
16,278. ELECTRICALLY-HEATED WATER AND LIKE SERVICES AND SYSTEMS. H. A. Gill. (A. E. Woods.) October 7th, 1918. (133,422.)
16,444. ELECTRIC WELDING. British Thomson-Houston Co. (General Electric Co.) October 9th, 1918. (133,439.)
16,603. REGISTERING ATTACHMENTS FOR TELEPHONES. A. Reubenstone. October 11th, 1918. (133,455.)
17,466. GAS EXITS FOR GALVANIC BATTERIES. G. Oldham and J. Oldham. October 25th, 1918. (133,483.)
17,543. ELECTRIC FURNACES. H. A. Kent. October 28th, 1918. (133,485.)
18,086. ELECTRIC IGNITION FOR INTERNAL-COMBUSTION ENGINES AND THE LIKE. W. Pickard and D. R. Dobson. November 5th, 1918. (133,499.)
18,433. ELECTRIC ARC LAMPS. H. B. Grylls and W. Heape. November 11th, 1918. (Addition to 4,866/17.) (Cognate applications 20,965/18.) (133,510.)
18,614. INDUCTANCE COILS. H. A. Ewen. November 13th, 1918. (133,510.)
19,005. SHUTTLES FOR WEAVING IN ELECTRICALLY-STOPPED LOOMS. H. Jowett and J. Wilkinson. November 20th, 1918. (133,521.)
20,863. ELECTRIC ALTERNATING CURRENT SLIP RINGS MOTORS, AND SHORT CIRCUITING AND BRUSH LIFTING GEAR THEREFOR. Mavor & Coulson and M. S. Moore. December 14th, 1918. (133,541.)
21,549. ELECTRICALLY-HEATED UTENSILS. J. G. Lozano. December 23rd, 1918. (133,545.)

1919.

2,471. STARTERS AND CONTROLLERS FOR ELECTRIC MOTORS. E. N. Bray and Bray Markham and Reiss. January 31st, 1919. (133,580.)
4,111. DETACHABLE FIXINGS FOR ELECTRIC LAMPS OR OTHER ARTICLES. Fuller Accumulator Co. and A. P. Welch. February 19th, 1919. (133,590.)
4,555. ROTARY ELECTRIC SWITCH. C. Braun. February 24th, 1919. (133,592.)
5,863. PORTABLE ELECTRIC LAMPS. J. Tweedie. March 10th, 1919. (133,600.)
10,926. ELECTRIC LAMP LANTERNS. Cable Accessories Co. and F. H. Reeves. May 2nd, 1919. (133,625.)
12,157. PROTECTIVE ARRANGEMENTS FOR DYNAMO-ELECTRIC MACHINES. British Westinghouse Electric and Manufacturing Co. June 17th, 1918. (Addition to 120,911.) (128,546.)
13,317. ELECTRICAL TRANSFORMERS. Siemens Bros. Dynamo Works, J. W. Howard and L. D. Morphew. May 27th, 1919. (133,639.)
14,354. ELECTRICAL SYSTEM FOR GENERATING INTERMITTENT HIGH-TENSION CURRENT IMPULSES FOR IGNITION PURPOSES WITH OR WITHOUT LOW-TENSION CURRENT FOR BATTERY CHARGING, LIGHTING, AND THE LIKE. C. H. Tower. September 10th, 1919. (Divided application 14,715/18.) (133,643.)
15,112. BRUSH HOLDERS FOR DYNAMO-ELECTRIC MACHINES. C. M. Owen. June 16th, 1919. (133,648.)